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ABSTRACT

This document contains the Guidelines for Teaching Science-Related Social Issues adopted in 1982 by the National Council for the Social Studies and 10 examplar lessons each keyed to particular guidelines and drawing upon contemporary issues. The premise upon which the guidelines are based is that science is a social issue and that the examination of scientific issues offers an excellent opportunity for helping students develop a synthesized perspective on science-related ideas in conjunction with social, political, economic, ethical, and philosophical concepts. The lessons are: (1) "Food Chain"; (2) "The Energy Puzzle"; (3) "The Years Between The Wars"; (4) "Nuclear Power: An Exploration of the Concepts, Issues, and Controversies"; (5) "Focus on Today's Arms Race"; (6) "Computer Technology and Privacy"; (7) "Nuclear Power Issues"; (8) "Low-Level Radioactive Waste: Social, Scientific, and Economic Issues"; (9) "Science, Technology, and Health"; and (10) "Science/Society Issues in Current Events: News and Nukes." Suggestions for student activities, evaluation procedures, and sources of reference are contained in each lesson. Included is an annotated bibliography. (KWL)

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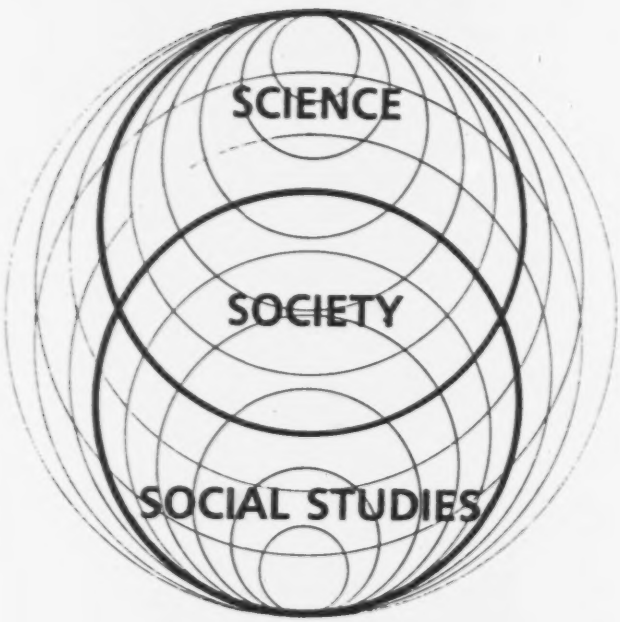
Implementation of the NCSS Guidelines for Teaching Science-Related Social Issues: Exemplar Lessons



Robert A. Otto, Editor
Science and Society Committee
National Council for the Social Studies

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CONTENTS

Guidelines for Teaching Science-Related Social Issues. 1
NCSS Science and Society Committee

Food Chain 5
Robert A. Otto

The Energy Puzzle 7
Robert A. Otto

The Years Between the Wars 12
Phillip A. Heath

Nuclear Power: An Exploration of the Concepts, Issues, and Controversies 16
Gary D. Regnerus and Jeffrey J. Blaga

Focus on Today's Arms Race 19
Elizabeth A. Richardson

Computer Technology and Privacy 22
Robert A. Otto

Nuclear Power Issues 26
James K. Shillenn and John R. Vincenti

Low-Level Radioactive Waste: Social, Scientific, and Economic Issues 34
James K. Shillenn and John R. Vincenti

Science, Technology, and Health 36
Faith M. Hickman

Science/Society Issues in Current Events: News and Nukes 49
Jacob L. Susskind

Sources of Information: An Annotated Bibliography 68
Sara F. Anderson

Guidelines for Teaching Science-Related Social Issues

Science and Society Committee
National Council for the Social Studies

Adopted by the NCSS Board of Directors
November 1982

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Position Statement

The impact of science and technology upon society, be it an environmental impact study, the energy problem, or other timely occurring issues, indicates a need for social studies and science educators alike to develop guidelines for teaching about science-related social issues. Science is a social issue; and the examination of scientific issues offers an excellent opportunity for helping students develop a synthesized perspective on science-related issues, a synthesis of the technical data coupled with social, political, economic, ethical, and philosophical information.

Editors of educational journals in both science and social studies support the need for an integrated, interdisciplinary approach in our teaching since it can provide: (a) information on the scientific components of a problem and the various effects of different solutions, (b) understanding of ways to evaluate risks and benefits, and (c) opportunities to make value judgments. Certain basic understandings are best learned when content areas are brought together in studying the critical issues, be it the energy situation, computer technology, medical technology, food, or defense spending. The integration of content areas must be preceded by an awareness that the integrity of each discipline is regarded.

People experience science in a social context and educators must become scientifically literate. Science and social studies educators alike need to become knowledgeable about each other's discipline by (a) attending together professional meetings of each other's organization, (b) reading professional literature in each other's area, and (c) team-teaching an interdisciplinary course with a colleague in the other discipline. The knowledge contributed by social science education in the various disciplines and the valuing process along with the scientific data and process skills contributed by the science educator are a welcomed mix for students in receiving a more balanced perspective on science-related social issues. Both the scientific and social science community must share a responsibility for helping students understand the effects of science.

Robert Otto, *Western Kentucky University*
Phillip Heath, *Ohio State University*
Nancy Roberts, *Wesley College*
Barbara Barchi, *National Diffusion Network*
Robert Snavely, *Kohler Public Schools, Wisconsin*

An Introduction to the Guidelines

The purpose of this set of guidelines for teaching about science-related social issues by the NCSS Science and Society Committee parallels the purpose of the Energy Education Guidelines submitted by this committee and published last year (*Social Education*, November,

1981). Both sets of guidelines can function in the following ways:

1. A guide for schools and communities, teachers, departments, and school districts interested in introducing multidisciplinary programs, courses, minicourses, or units in existing social studies or science courses.
2. A baseline from which to assess instructional programs and materials for students and teachers, given the increasing amount of material on science-related issues. The mass media, most notably television, present material on science-related issues—in regular programs and serials as well as documentaries—and students need instruction on evaluating such material intelligently.
3. A starting point for a wider dialogue on the nature, scope, goals and methods of teaching about science-related social issues within the context of the social education of children and youth.

In addition, these guidelines for teaching about science-related social issues serve a fourth function.

4. A starting point for an even wider dialogue throughout the community on these science-related issues, with the eventual goal of reaching some consensus about basic human needs and values which form the foundation for decision-making about such issues.

The NCSS Curriculum Guidelines numbered 2.4 and 3.5 contain several direct references to the role of scientific information in the social studies as well as the Essentials of Education which require scientific information for their fulfillment. Clearly, in an age in which scientific knowledge is increasing exponentially, effort must be expended to teach young people how to use such knowledge, for knowledge is the keystone for responsible action. Valuing provides direction and a framework for decision-making; and abilities involved in obtaining, interpreting and applying knowledge within an ethical framework are essential. These general areas—knowledge, valuing and skills—are treated in the NCSS guidelines numbered 3.0 and 5.0. Our guidelines are meant to complement the NCSS guidelines, and the Essentials of Education by providing teachers with more specific guidance in teaching science-related social issues in their classes.

Studying about science-related social issues using the processes described in these guidelines have specific beneficial outcomes:

(a) It will prepare young people to analyze issues and to use empirical data collected from primary and secondary sources to make informed judgements about these issues.

(b) It will give students opportunities to explore value-laden issues, clarify their own values, and use these values as a basis, along with information obtained and analyzed in a problem-solving framework, for making personal and societal decisions.

(c) It will contribute to students' cognitive and moral reasoning development as described by Piaget and Kohlberg.

(d) It will prepare young people to fulfill various roles as adults—voting citizen, consumer, worker, family member, friend, and member of social groups.

(e) It will contribute to the changes in curriculum necessary to meet the challenges of a rapidly changing society.

Our guidelines include suggestions for choosing topics for classroom discussion, evaluating existing materials, setting objectives in the areas of gathering, processing, evaluating and applying information to problems and issues, and for evaluating student achievement of these objectives.

Guidelines for Teaching Science-Related Social Issues

1. Choosing a Topic and Evaluating Existing Material

Considerations for topic choice include:

a. Teacher expertise and ability.
b. Resources available, including other teachers and experts in the field, for teachers and students.
c. Student interest, concerns, grade level, cognitive ability, and subject matter levels.
d. Compatibility of topic with existing course of study or on-going educational activity.
e. General appropriateness of topic and its lasting importance and contribution toward general education.
f. Whether this topic would contribute to an overload of gloom and doom. Can solutions be offered? Can the issue be resolved by a free society acting together?
g. Topics provide opportunities for an accurate meld of science and social studies approaches to the particular topic.
h. Relevance of topic to students' immediate lives or lives in the imaginable future. Processes of problem-solving and ethical decision-making are learned while studying a personally relevant issue; and then generalized to more complex and profound issues as the student matures and becomes more comfortable dealing with science-related issues.

1.1 Teachers attempting to introduce science-related issues into their classes must be aware of the attitudes and sensitivities toward the topic in the community.

1.2 Information presented must be *balanced* so that all points of view are presented in such a way that they have approximately equal impact. For example, can an article offer as flashy bait as a well-financed film?

1.3 Teachers discuss their plans to teach about a science-related social issue with their director of instruction and/or principal before beginning. Since these issues are very sensitive, it is best to discuss the matter with school personnel ahead of time.

1.4 The topic chosen must be illustrative of some general aspect of the interrelation between science and society. Examples of general aspects of the science/society interrelation include:

a. Scientific information is a determinant of government social policy, e.g., the Supreme Court school integration decision was based on social science information indicating the psychological harm done to black students by segregated school systems.

b. Government policy is a determinant of the direction of scientific research, especially through its funding procedures, e.g., emphasis on cancer-cure research.

c. Application of scientific information (technology) is a cause of social change, most of which is indirect, unplanned and unexpected, e.g., the use of antibiotics and insecticides as a cause of population growth in developing "third world" countries.

d. Application of scientific information affects personal freedom of choice, e.g., birth control methods, especially the "pill," made childbearing a matter of choice; conversely, behavior control methods used by public institutions can limit personal freedom.

e. The effect of social values on scientific research, e.g., the development of birth control methods; cancer research stressing cure rather than prevention.

f. Individual and societal responses to rapid change and enlarged area of choice, described in Toffler's *Future Shock* need to be considered and discussed.

g. The nature of human values and the nature of human beings from which those values spring, e.g., the biological nature of mankind and the environments which allow the fullest development of human potential. This topic of human nature represents a vital touch point between the social and the natural sciences. Social psychological research sheds light on situational and cultural antecedents of social behavior.

h. The social responsibilities of scientists in influencing the use to which their discoveries are put.

i Ethical issues in scientific research involving human beings, e.g., responsibilities of experimenter in providing "informed consent" of subjects.

j. Areas of personal decision-making regarding the use or nonuse of a particular new product or technology, e.g., to know the possible negative side-effects of certain medicines or cosmetics. What are the responsibilities of industry, government and the consumer in providing/obtaining the information necessary for making a wise decision?

1.5 Materials chosen must be well written, or in the case of audio-visual materials, well produced in order that they meet your objectives. Some audio-visual materials, for example, are interesting and/or artistically and technically well done, but do not clearly present the information.

1.6 The process of decision-making or problem-solving, whichever is relevant to the topic chosen, must be emphasized over facts.

1.7 Concepts and principles must be emphasized over facts; facts as related in concepts and principles, and the construction of the latter need to be taught.

2. Gathering Information

Teachers help students:

a. Locate information in the physical and biological sciences.

b. Read and acquire information from scientific reports.

c. Develop basic science vocabulary and concepts.

d. Locate social science information.

e. Develop basic social science vocabulary and concepts.

f. Collect their own raw data using surveys, observations, interviews, and other means of collecting data from primary sources.

g. Learn through careful analytic viewing and listening to television, radio, films, filmstrips and other media, as well as through reading of books and publications written at the layperson's level.

3. Processing Information

Teachers help students process information by increasing their competency in:

a. Observing, especially the making of controlled observations.

b. Classifying information.

c. Using numbers and finding averages.

d. Identifying movement and direction, rates of change over time and trends.

e. Extrapolating information, reading and constructing maps, graphs, tables, charts.

f. Constructing inferences based upon observations.

g. Making generalizations supported by informational findings.
h. Use of concept formation on inquiry strategies.

4. Evaluating Information

4.1 Teachers help students determine the usefulness of informational documents when they:
   a. Identify the author and publications.
   b. Determine the area of expertise of the author.
   c. Detect bias and state possible reasons for bias in interpreting facts given in an article or presented in a film.
   d. Determine the audience for the print or nonprint information.
   e. Learn some of the techniques for checking the reliability of an information source.

4.2 Better, more usable programs result when students can:
   a. Compare data from one source to another source.
   b. Separate facts from interpretations in an article.
   c. Find facts that support conclusions the author makes.

4.3 A good informational source's facts:
   a. State the methods used for obtaining them.
   b. Deal directly with the problem under consideration.
   c. Fit the conclusions drawn or support the hypotheses with the facts.

4.4 The use of primary sources of information needs to be encouraged whenever possible.

5. Problem-Solving

5.1 Teachers help students define the problem under study carefully, noting the variables:
   a. The parties involved or affected (individuals and groups).
   b. The causes of the problem, such as new technology for which there is no precedent; no legal, political, social or ethical framework.
   c. Interaction of causes and factors contributing to the friction or creating the problem.
   d. Nature of the problem—moral, political, social, etc.

5.2 Teachers help students determine what information is necessary in order to deal with the problem and help them locate and evaluate this information.

5.3 Teachers help students apply their information to the problem. The information should:
   a. Specifically apply to the problem area affected.
   b. Explicate or define further the causes and factors as identified in 5.1 a and b. If the information does not apply, the student should return to the information-gathering steps and begin again.
   c. Note and explain new or additionally discovered factors.
   d. Make clear the interaction of factors.
   e. Be analyzed to ascertain that the nature of the problem is correctly identified.
   f. Suggest solutions that apply. That is, political problems require political solutions; ethical problems may require individual ethical choices.
   g. In some cases, lend itself to use in simulations and games or to graphically prepared data so that students can begin to predict possible results of different solutions.
   h. Evaluate consequences of each possible outcome in terms of *clearly stated and ranked* values of the person or group.
   i. Make recommendations or draw conclusions, based on previous steps a–h.

5.4 Teachers provide opportunities for students to use various valuing, decision-making models in hypothetical situations. Examples of decision-making models are (1) Brady's ethical decision-making model, (2) Fletcher's Guidelines for making ethical decisions, (3) Kurtz's Guidelines for evaluating moral issues, (4) Kohlberg's moral reasoning, (5) Rath's value clarification, and (6) Oliver's jurisprudential inquiry

6. Evaluating and Testing

Teacher evaluations need to provide:
   a. A valid means ascertaining whether or not stated goals and objectives have been met.
   b. For continuous feedback and modification as needed after the unit is underway.
   c. An opportunity for differing student views as long as these views are supported by facts. No one particular point of view needs to prevail.

Sara Anderson, Northern Virginia Community College
Helen Carey, National Science Teachers Association
Edited by Robert Otto

Title: Food Chain

Guideline Code: 3 f: inferences based upon observations

Grade Level: elementary

Contributor: Robert A. Otto, Western Kentucky University, Bowling Green, KY

Objective: The student will interpret the effects of actions upon the food chain.

Procedure:

1. Using the food chain diagram(next page), ask the following questions:
   a. If the animals are eliminated, who could survive? (humans, plants, sun)
   b. If plants are eliminated, who could survive? (animals, plants, sun)
   c. If plants are eliminated, who could survive? (sun)
   d. If the sun is eliminated, who can survive? (no one)
   e. Is the food chain important to our life? (Yes, because we depend on other groups, groups are interrelated, and one group can have an effect upon others.)
   f. Are there issues to study in the food chain? (effects of: pollution, population,land use, fertilizers, environmental impact.)

2. An alternative to Activity #1 would be for a student to represent each group on the food chain, having the name tag of the group placed on the student. Then using string, connect strings to students like the diagram shows. When questions 1a-f are asked, the groups being affected should sit down. Lastly, the students could be asked to draw the food chain, having only seen the enactment by students in Activity #2 and not seeing the diagram.

3. Using a bulletin board or large chart, the students could be asked to bring pictures which would be examples of the different groups shown in the food chain diagram and place the pictures next to the appropriate group. Magazines or student drawings could be sources. Examples of groups might be cow, cereal, grass, seed, bean, fish, chicken.

Evaluation: Student response to questions.

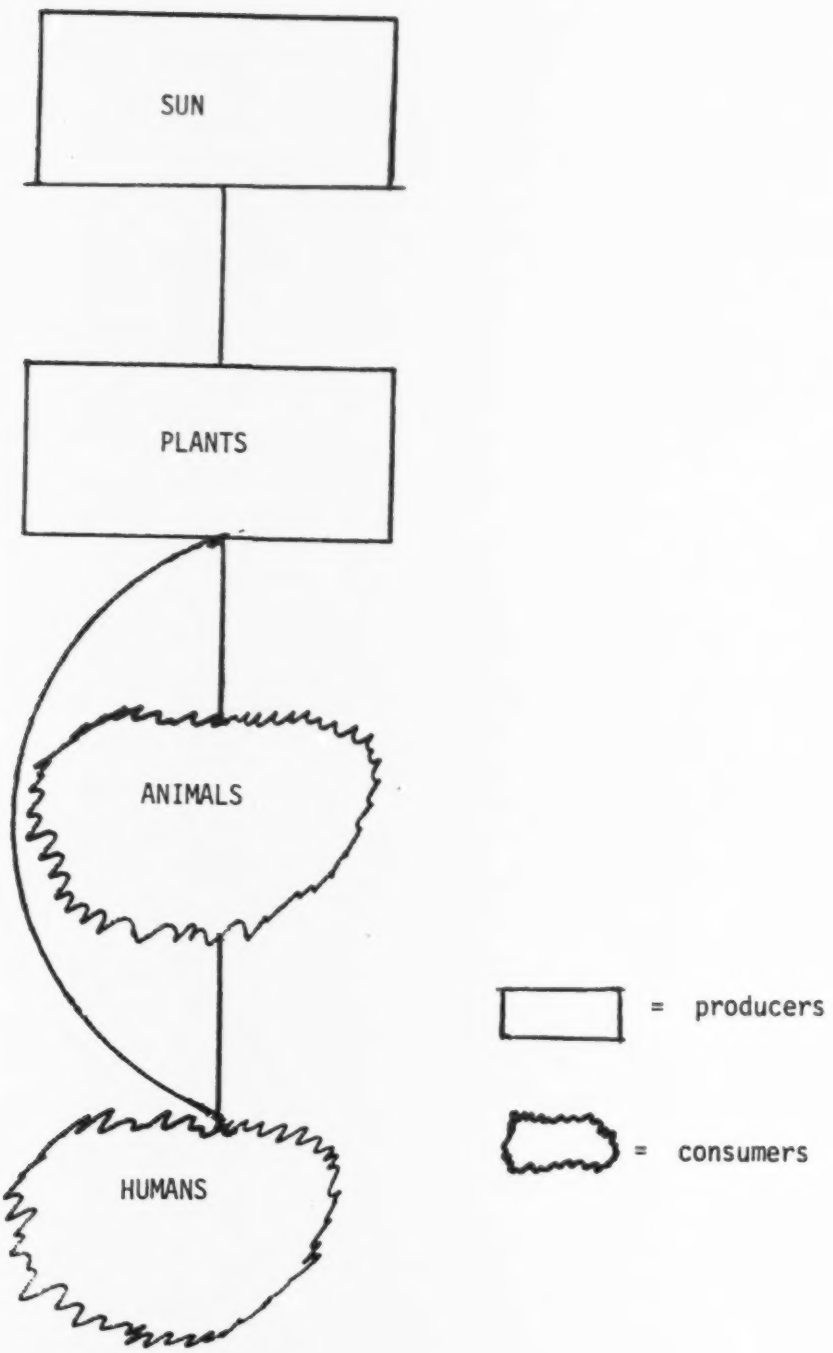
Student actions with strings.

Student diagrams.

Student examples of groups brought to class.

Bibliography: National Science Teacher Association, Energy: The Thread of Life, Project For an Energy Enriched Curriculum, 1742 Connecticut Ave. NW, Washington, DC 20009. One of the K-12 grade teaching units developed from a U. S. Department of Energy grant.

FOOD CHAIN DIAGRAM



Title: The Energy Puzzle

Guideline Code: 3 a,b,c,f,g : Processing Information

Grade Level: Elementary

Contributor: Robert A. Otto, Western Kentucky University, Bowling Green, KY

Objective: The student will state the difference between U.S. energy production and U.S. energy consumption.

Procedure:

1. Handout the U.S. Consumption and U.S. Production Circles[1] and have students cut out and assemble the pieces. Is there any difference in the two cirlces? What is it?

2. Have students look at the Sources of Energy handout and discuss the effect of imports and the future of energy resources.

3. Handout to students the Oil-Based Products[2] sheet and have them circle ten products that are important to them. Since about 50% of our oil is imported(from activity #1 and #2), have students now eliminate five products. This is the impact that a cut-off of imported oil could have upon our living- an oil embargo.

4. Have students list ways to become more energy efficient, lessening our dependence on imported oil. (improved gas mileage, mass transportation, home insulation, use of alternative fuels: solar.)

Evaluation:

1. After completing activity #1, have students write the percentage of difference in oil consumption versus U.S. oil production.

2. Have students list ways for the U.S. to become more energy efficient.

3. Have student design/create new, energy efficient product. (solar tea, electric car, etc)

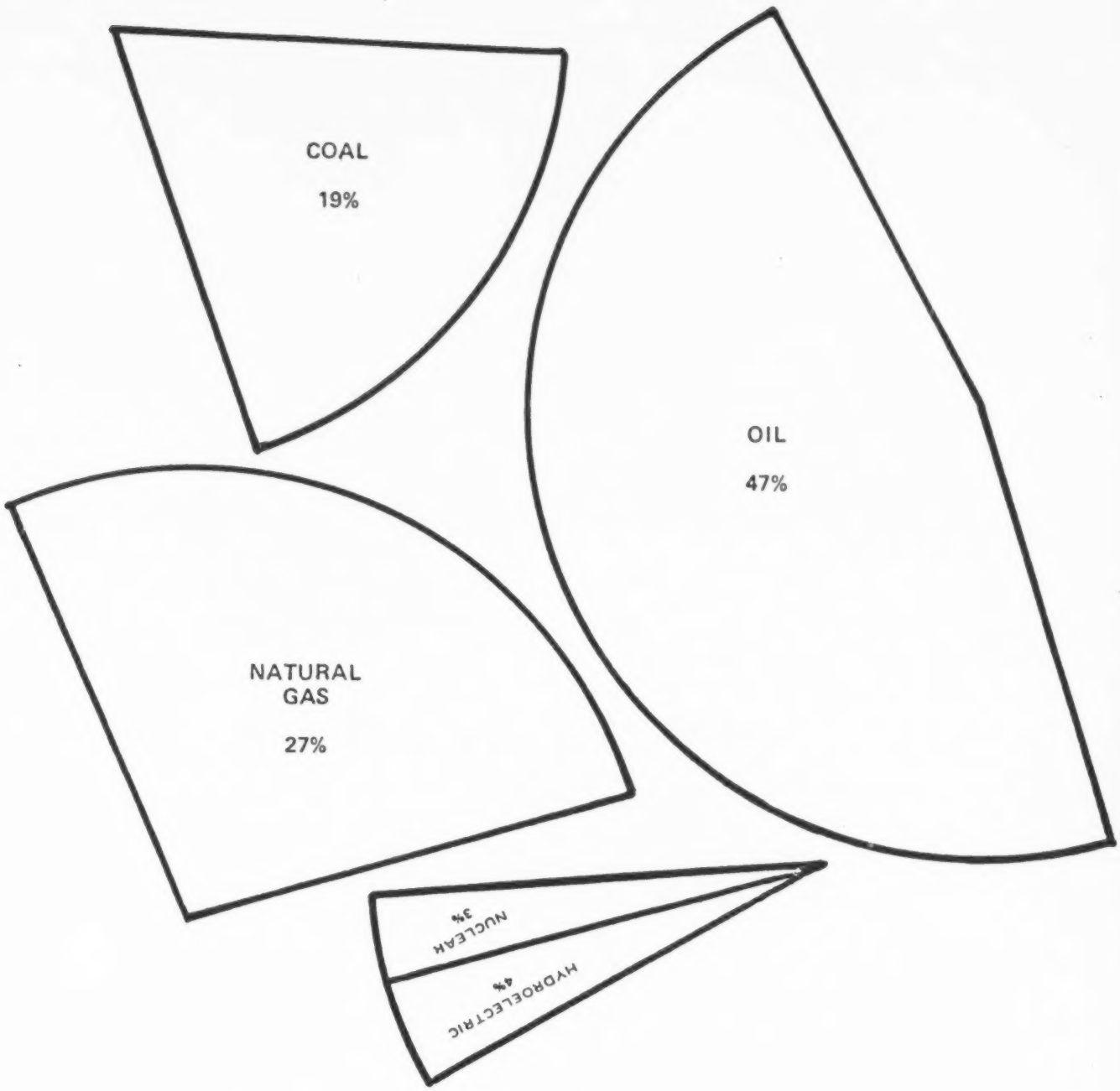
Bibliography:

1. National Science Teachers Association, The Energy Dome, Project For An Energy Enriched Currieulum, 1742 Connecticut Ave. NW, Washington, DC 20009. A teaching unit developed under U.S. Department of Energy grant.
2. Energy Transitions in U.S. History, Ibid.

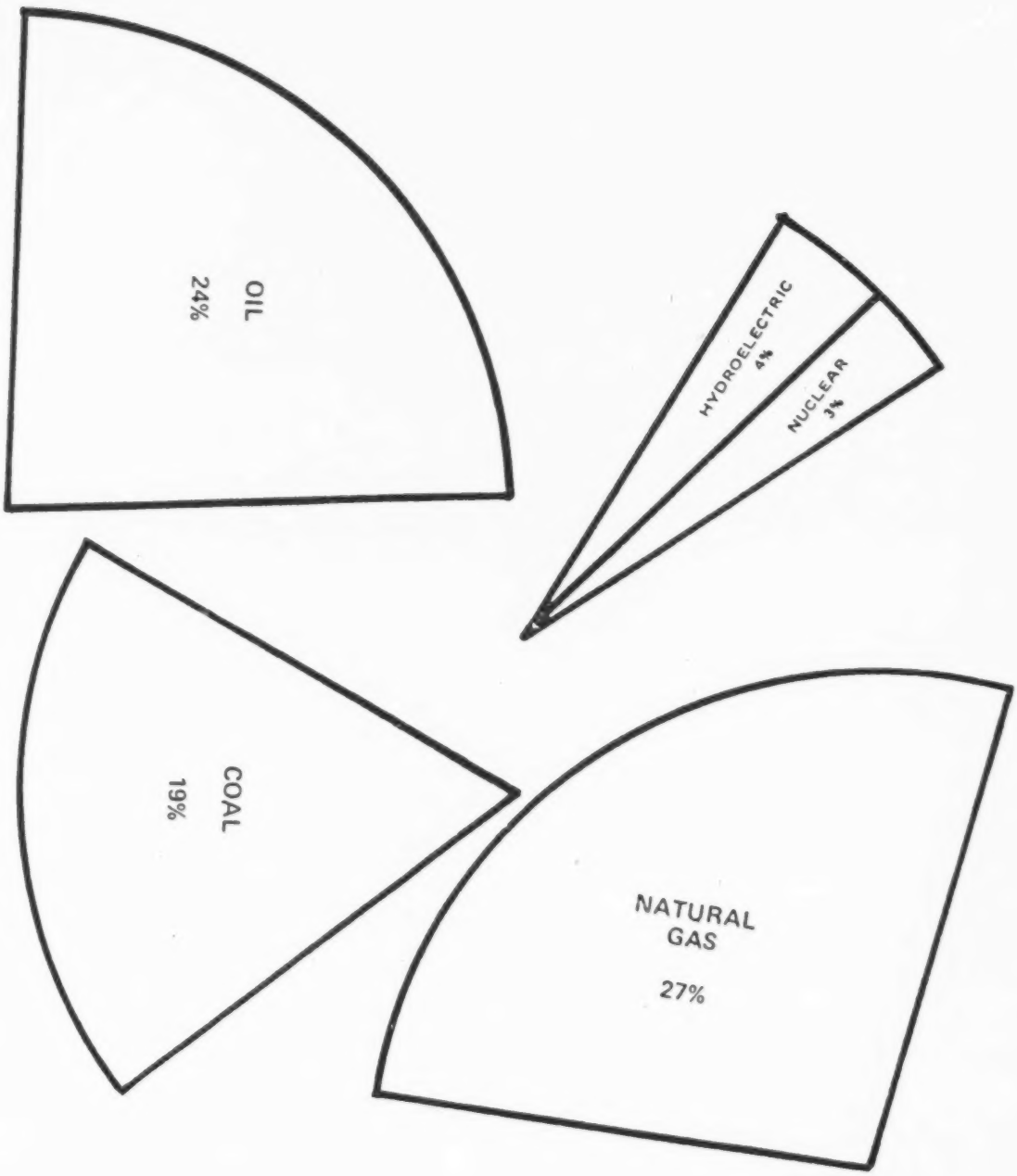
John M. Fowler, Energy-Environment Source Book, National Science Teachers Association, 1742 Connecticut Ave. NW, Washington, DC 20009.

Donald Scherer, Personal Values and Environmental Issues: A Handbook of Strategies Related to Issues of Pollution, Energy, Food, Population, and Land Use, Hart Publishing, New York, NY., 1978.

U.S. CONSUMPTION CIRCLE - 1976



PRODUCTION CIRCLE - 1976



OIL-BASED PRODUCTS

Crayons
Parachutes
Telephones
Overcoats
Deoderants
Bedspreads
Tubs
Jerseys
Fences
Pillows
Syringes
Shoes
Hair spray
Purses
Pajamas
Dresses
Earphones
Antiseptics
Shower doors
Floor wax
Paneling
Earrings
Golf balls
Wet suits
Laxatives
Trash cans
Rafts
Tiles
Wallets
Backpacks
Mailboxes
Cassettes
Luggage
Antifreeze
Antenna cable
Heart valves
Safety flares
Lunch boxes
Phonographs
Soap dishes
Volley balls
Sleeping bags
Oxygen masks
Card tables
Warm-up suits
Weed killers
Carbon paper
Hearing aids
Clothesline
Patio screens
No-wax floors
Lighter fluid
Oil filters
Flashlights
Antiboities
Permanent-press clothes
Disposable diapers
Playing cards
Windshield wipers
Kitchen counter tops
Dune buggie bodies
Electrician's tape
American flags
Steering wheeles
Golf-cart bodies
Mattress covers
Acrylic paints
Bearing grease
Air conditioners
Rubbing alcohol
Flashlights
Motorcycle helmets
Garden hoses
Carpet sweepers

Sources of Energy

	1976 Use/Producer		1988 Use/Producer		Depletion (at present rate)
Oil	47%	U.S. 51% Import 49%	40%	U. S. 40% Import 60%	20 years
Natural Gas	27%	U. S. 100%	20%	U. S. 70% Import 30%	20 years
Coal	19%	U. S. 100%	28%	U. S. 100%	300 years
Nuclear	3%	U. S. 100%	5%	U. S. 100%	100 years
Hydroelectric	4%	U. S. 100%	4%	U. S. 100%	No projection
Solar			1%	U. S. 100%	None: First significant usage begins in 50 years
Synthetic fuel			4%	U. S. 100% (beginning in year 2000)	No projection

1. The fossil fuels are non-renewable, depletable resources (oil, gas, coal).
2. Above figures beyond 1976 are best estimates.
3. The most depletable resources are oil and gas.
4. The most promising resources are coal, nuclear, solar, synthetic fuel.

Title: The Years Between the Wars

Guideline Code:
1.4: a, c, f, j interrelation between science and socity.
2.0: a-g gathering information.
3.0: a, b, c, d, f processing information
5.1: a, b, c problem-solving
5.2
5.3: d, g
6: a evaluating and testing

Contributor:
Phillip A. Heath
Ohio State University

Grade Level: 4 and 8

Overview:

The period of time between World War I and World War II and present day have several similarities including rapid social and technological change and periods of unemployment, and changing vocational patterns. While it is sometimes difficult for elementary school aged students to understand these conditions as they once existed drawing comparison and building conceptual relationships between the more relevant here and now and the events of the 1930's better ensures that students will understand both periods of time. The specific focus of this lesson is on the impact of technological change. During both periods advancing technology has resulted in both social and employment changes. At present the advance of the microprocessor is just one example of social technology.

Lesson Goals:

This lesson will provide students with opportunities to investigate the events of the 1930's, to draw parallels to events of the present, and to discover significant concepts common to both science and social studies. Only sample activities are listed. These are intended to be "springboard" activities rather than a comprehensive unit of study.

Lesson Objectives:

At the end of the lesson students will:

1) understand the concept of the Stock Market and its interrelatedness to social conditions.

2) be able to discuss some of the causes and impacts of changing vocational and employment patterns.

3) the feelings of the people, technology, economy, and events of the 1920's and 1930's.

4) be able to name specific technological changes (e.g., manufacturing, communication, aeronautical, etc.), relate to changing social phenomena of both periods of time.

Recommended Activities:

1) Radio Show: Have the students create a script of a radio news broadcast that summarizes major events of selected periods of time or

events of the 1920's and 1930's. Have them include where possible the concepts of:

"New Deal"
Prohibition
"WPA"
Depression
Recession
"CIO"
"Dust Bowl"

and the people:

Franklin D. Roosevelt
Charles Lindberg

Encourage students to present the impacts of these in their broadcast.

2) Divide the class in two large groups. Subdivide each group into smaller groups (2-3 students). Have one half of the class outline articles for a new paper edition that would have been printed in the 1930's. Have the second half do the same thing for the year 2020. Have them emphasize sound technological impacts.

3) Transportation Mobiles or Time Lines: Have students make a mobile or time line showing technological change in transportation, communication, and manufacturing. These mobiles or time lines must include examples from the 1920's and 1930's and from the 1980's. Materials needed include: coat hangers or wire, yarn, construction paper, scissors, crayons. Emphasize in discussions the impact of technology including the concepts of mass production, telecommunication, decreasing world size, and social mobility.

4) Have students do reports on technological changes in the 1920's and 1930's and then impact on social events. Have similar reports on impacts of recent technological events. Compare and contrast these. Emphasize the significance of technological changes on jobs, education, and social mobility.

5) Have students investigate the concept of mass production. Introduce the idea and history of assembly lines. Tour a facility where items are mass produced, or invite a guest speaker from one. Have the students develop something which can be mass produced in the classroom. Identify tasks and have the items produced. Keep track of materials and time/wages. Graph the results. Decide on the cost of the item. Discuss: "Would you buy homemade or mass produced pizza?" "Would you buy homemade or mass produced shoes?" Have students prepare posters showing things once produced by hand and now mass produced. Discuss the impact on quality, cost, jobs, social change, etc.

Have students debate the issues of advantages, etc. of mass production. List these on the board and discuss decisions.

6) Investigate the concepts of communication and transportation. Discuss

with the students what transportation and communication was like in the 1920's and 1930's. Discuss items relating to highway, trains, automobiles, air travel, speed, and cost and items relating to radio, T.V., telephones, etc. Have them plan an imaginary class trip to another state. List time, cost, highways, lodging, and items that should be taken. Have students research what communication was like from 1920-1940. Let students select items and give group reports. Encourage them to discuss effectiveness of communication and contrast this to present day. Discuss the items impact of satelites, mocro-waves, television, and telecommunications.

Have students work in small groups and pretend they are time travelers returning from the year 2020. Have them present an account and at least one accompanying illustration of what communication and/or travel will be like in the year 2020. Have them present this to the whole class.

Evaluation:

1) Group work: observe students as they work in groups; check for level of participation and contribution.

2) Quizzes/Exams: check students understanding of major terms and concepts.

3) Reports: in both group and individual student reports check for research efforts, clarity, and support of major ideas in science and social studies, and level of understanding.

4) Posters: check for extent of participation in preparation, significance of ideas, and originality/creativity.

Bibliography:

Armstrong, Louise. HOW TO TURN LEMONS INTO MONEY. New York: Harcourt, Brace, Jovanovich, 1976.

Daniels, Jonathan. THE TIME BETWEEN THE WARS. New York: Doubleday & Company, Inc., 1966.

Freedman, Russell. IMMIGRANT KIDS. New York: E. P. Dutton, 1980.

Katz, William L. AN ALBUM OF THE GREAT DEPRESSION. New York: Franklin Watts, 1978.

Morrison, Dorothy. LADIES WERE NOT EXPECTED. New York: Atheneum, 1977.

Pardis, Adrian A. BULLS AND THE BEARS: HOW THE STOCK EXCHANGE WORKS. New York: Hawthorn Books, Inc., 1967.

Rogers, Agnes and Frederick Lewis Allen. I REMEMBER DISTINCTLY. New York: Harper & Brothers Publishers, 1947.

Schwartz, Alvin. THE UNIONS: WHAT THEY AR , HOW THEY COME TO BE, HOW THEY AFFECT EACH OF US. New York: Viking Press, 1972.

Schwartz, Alvin. WHEN I GREW UP LONG AGO. Philadelphia: Lippincott. 1978.

Sterling, Dorothy. WALL STREET: THE STORY OF THE STOCK EXCHANGE. New York: Doubleday & Company, Inc., 1955.

United States History Society, Inc. PICTORIAL ENCYCLOPEDIA OF AMERICAN HISTORY, Volume 12 & 13. Illinois: Davco Publishing Company, 1962-1968.

Teaching Units

Energy and Transportation , Transportation and the City,

Energy Transitions in U.S. History , Energy, Engines, and the Industrial Revolution

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Title: Nuclear Power: An Exploration of the Concepts, Issues, and Controversies

Guideline Code: 3a, e, f, h: Processing Information
4.1a, c, e : Evaluating Information
4.2a, c

Grade Levels: 5-12

Contributors: Gary D. Regnerus
Unity Christian High School
Orange City, IA 51041

Jeffrey J. Blaga
Malcolm Price Laboratory School
University of Northern Iowa
Cedar Falls, IA 50613

Lesson Objectives:

1. For the student to discuss and develop an awareness of a wide range of issues and perceptions associated with nuclear power.
2. For the student to become more aware of how an editorial cartoonist can "water down" or simplify controversial and complicated topics, such as nuclear power.
3. For the student to realize that the media should not be our only source of information.
4. To have the student consider alternative sources of information regarding nuclear power.

Lesson Procedures:

This lesson provides a unique and interesting way to introduce nuclear power to students. Nuclear in this sense refers to various aspects of nuclear technology, including power plants, medicine, weaponry, etc. Teachers and students can explore many of the issues and perceptions related to this complicated and often controversial topic.

1. Teachers need to collect a set of editorial cartoons prior to conducting this lesson. Use the cartoons as student handouts and to make transparencies prior to the lesson. Cartoons should represent a balance and range of issues related to nuclear topics such as electrical power, weapons, demonstrations, war, etc.

2. Begin this lesson by having students brainstorm as to what comes to mind when they think of nuclear power. Students should keep their lists for possible future reference. Instruct the class that they are now going to look at some cartoons that have appeared in the media that relate to this topic.

3. Divide the class into as many groups as there are cartoons. Allow students several minutes to study their cartoons. The teacher will need to circulate among the students to answer questions and direct student inquiry. Then have each group prepare a brief class presentation that attempts to answer the following questions regarding their cartoon:

- What does this cartoon, in general, tell us about nuclear power?
- What particular aspect of nuclear power does the cartoon represent?
- How do you think the cartoonist feels about nuclear power?
  What historical events need to be understood when interpreting this cartoon?
- What symbolism is used by the cartoonist?
  What is the attitude of the general public according to the cartoonist?
- If you had only this cartoon as your source of information about nuclear power, what would you think of the issue?
- Do you think the cartoonist is fair in his/her portrayal of nuclear power?
- What relevant facts are being neglected by the cartoonist?
- What sources of information could be used to gain a more comprehensive view of this issue?
- Where could this data be obtained?

Lesson Evaluation:

While this lesson is best suited for an introduction to nuclear power, certain evaluative procedures can be used to measure students' understanding of the lesson's objectives:

1. Have students compose a position paper on the impact a cartoonist (or media in general) can have on the public. This would include having students consider ways individuals can obtain broader viewpoints on these issues. Also, students could write a research paper on one of the many concerns raised by nuclear power.

2. Have students develop cartoons based on their perceptions of nuclear power. Provide bulletin board space to display students' work. See student samples on back.
3. Have students collect additional cartoons and spend a few minutes of a class period for students to explain their findings.

4. Using the list of brainstorming items, have students explain in writing how their awareness of issues and perceptions was raised by the lesson.

5. Ask students to complete a T-chart (see below) that lists the individuals or groups who are involved in nuclear concerns and the nature of their involvement. This activity gives students a grasp of the breath of nuclear power concerns.

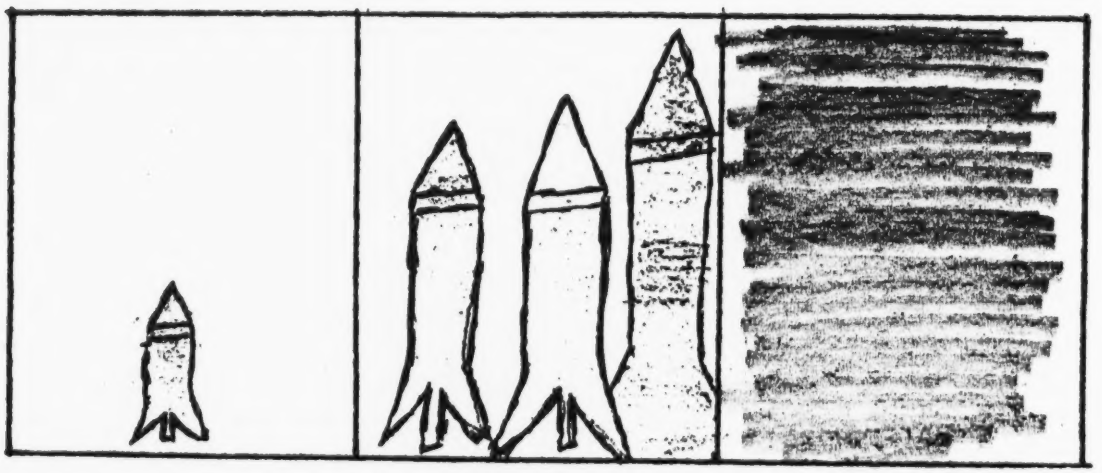
PEOPLE	NATURE OF INVOLVEMENT

Bibliography:

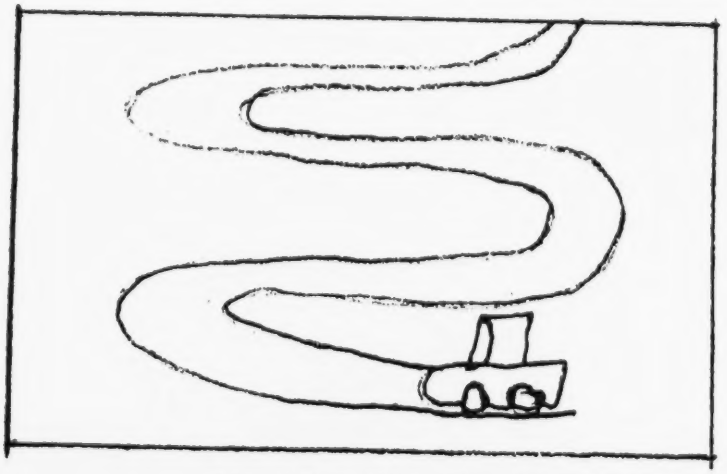
A school library is very useful when conducting this activity. Teachers can use a variety of periodicals to uncover cartoons dealing with nuclear power, such as Time, Newsweek, and U.S. News and World Report. Cartoons can also be obtained from local, regional, and national newspapers.

Other periodicals related to nuclear topics, such as The Bulletin of the Atomic Scientists, are good information sources. The Social Issues Resources Series(SIRS) contains reprints of articles involving nuclear power. Facts on File, found in most libraries, lists important events and data on this topic.

Student Samples



" Arms Race"



"Arms Reduction-Straight Ahead"

Title: Focus on Today's Arms Race

Guideline Code: 2g, Gathering Information
3g, Processing Information

Grade Level: Middle or High School

Contributor: Elizabeth A. Richardson
Meade County Middle School
Brandenburg, KY

Objective: The student will become aware of issues regarding the arm's race.

Procedure:

The lesson begins with a guided classroom discussion to determine how students feel about the arms race and its proximity to them.

A filmstrip entitled, "The Race Nobody Wins" is used as a means of provoking the students and challenging them to come to grips with the issue. Students are asked to react based on present knowledge, record their feelings, and make it a point to gather information during the lesson to enable them to take a more educated and informed position at lesson's end.

Using resource materials like "How Countries Spend Their Money," newspaper articles and magazines, the teacher helps the students to compare global expenditures, to identify global suppliers, to consider our country's role as well as the possibility of global cooperation, to identify and evaluate factors contributing to possible nuclear confrontation, and ultimately to "zero in" on the proximity of the arms race and its implications for their community. Ultimately, the lesson culminates in what is called "a community forum on the arms race." This is held using community resource persons such as: a minister, military personnel, news media personnel, businessman, parent, scientist, student, and a high school teacher.

Lesson Evaluation:

Students are asked to state their feelings,based upon their research and after listening to the forum speakers, concerning the arms race and the position our country should take.

Bibliography:

Kenneth A. Switzer and Paul T. Mulloy. "How Countries Spend Their Money", Global Issues: Activities and Resources for the High School Teacher, Social Science Education, Inc.(1979)

Citizens' Organization for a Sane World, The Race Nobody Wins. A sound/color filmstrip.

Teena Mayers, Understanding Nuclear Weapons and Arms Control: A guide to the issues, National Council For The Social Studies, 3501 Newark Street, NW., Washington, DC 20016, 1983.

HOW COUNTRIES SPEND THEIR MONEY

Directions: Listed below, in alphabetical order, are ten countries. Also listed are three headings: military expenditure per person, health expenditure per person, and education expenditure per person. Under each of the three headings, rank the ten nations in order, from the nation which you think spends the most (#1) to the nation which you think spends the least (#10) per person annually for each category. For example, of the ten nations, India spends the least per person for its military needs; thus it would be #10 under the military expenditures category. Be prepared to explain why your group decided to rank the countries as you did.

The ten nations, in alphabetical order, are Brazil, Canada, China, India, Japan, Saudi Arabia, Sweden, United States, USSR, and West Germany. (Figures in parentheses are based on world rankings of 140 countries).

Military Expenditure Per Person	Health Expenditure Per Person	Education Expenditure Per Person
1. Saudi Arabia, $593 (3)	1. Sweden, $582 (1)	1. Sweden, $625 (2)
2. USA, $426 (5)	2. West Germany, $424 (3)	2. Saudi Arabia, $512 (3)
3. USSR, $370 (7)	3. Canada, $413 (4)	3. Canada, $506 (4)
4. Sweden, $286 (8)	4. USA, $218 (13)	4. USA, $415 (7)
5. West Germany, $247 (10)	5. Japan, $173 (16)	5. West Germany, $308 (15)
6. Canada, $135 (23)	6. USSR, $70 (27)	6. Japan, $250 (21)
7. Japan, $42 (49)	7. Saudi Arabia, $61 (31)	7. USSR, $181 (25)
8. China, $19 (64)	8. Brazil, $9 (68)	8. Brazil, $35 (61)
9. Brazil, $17 (67)	9. China, $3 (97)	9. China, $11 (97)
10. India, $5 (101)	10. India, $1 (118)	10. India, $4 (121)

Title: Computer Technology and Privacy

Guideline Code: 1h: Relevance of topic to student life or future
1j: Personal decision-making regarding use of new technology

Grade Level: Junior High and High School

Contributor: Robert A. Otto
Western Kentucky University
Bowling Green, KY 42101

Objective: The student will become aware of the varied uses and social consequences of computers in storing personal information.

Procedures:

With the advent of computers, vast amounts of personal data are easily stored and instantly retrievable. Information is being collected in early life through school records beginning in kindergarten and continuing through college. If you apply for insurance, have a bank account, credit card, medical record, employment record, or pay taxes, personal information is stored about you on computers. So privacy of personal information and records becomes an issue during the computer technology era of the 20th century. If errors or false information is contained in a personal file, the individual may not know that it exists and misinformation can jeopardize employment opportunities or credit ratings. The following types of personal records are kept on most inidviduals and have varying degrees of privacy.

Government Records

Federal agencies like the Internal Revenue Service, the F. B. I., the Social Security Administration, the military are the most common record holders. The Privacy Act of 1974 provides the right that information about an individual in federal files will be kept private. Federal agencies are not to exchange data between each other without one's prior approval. An individual has the right to see the files and challenge the contents simply by writing to the agency.

School Records

The Family Education and Privacy Act of 1974 provides the right that school records will not be revealed to outsiders without the individual's consent. The school must have written permission to release data like grades and evaluations to employers. One who is 18 or older has the right to challenge accuracy of information. Likewise parents can act for minor children.

Credit Records

The Fair Credit Reporting Act of 1970 requires credit agencies to summarize the contents of files on an individual upon request. The individual has the right to challenge the accuracy of the credit bureau's records and to know when the issuance of an insurance policy or the granting of a job or credit has been adversely affected by a bad credit rating.

Banking Records

An individual's banking record is not strictly confidential. Financial instutions trade information with credit and loan businesses and law enforcement agencies. Electronic banking brings on a new concern for privacy rights since so much personal data is recorded.

Insurance Records

In applying for an insurance policy, the individual might have to sign a waiver for investigations in personal areas. If misinformation causes denial or cancellation, one might check with the insurance company to seek the information. In some states, a Department of Insurance might explain some regulations, if there are some.

Medical Records

A general right exists that medical records will be private. Many states restrict access to medical records. The American Medical Association ethics has a statement against revealing contents of records without one's consent. However, when filing an insurance claim, an individual may have to waive privacy rights. The employer and insurer may have easy access to the medical file.

Employment Records

Generally, there are no restrictions on the employer's use of your personnel file. Only California has a regulation that allows the individual to inspect or correct inaccuracies in the file.

After reading and discussing this information, the class might want to research into its state laws, if any, regarding the different types of records and privacy rights of individuals. Also the State Attorney General's Office might provide further information or resource speakers. A lawyer might be invited to the class to discuss an individual's rights both federal and state. Legal access to personal information was brought into the forefront because of the federal regulations under the Freedom of Information Act and the Privacy Act of 1974. Computer technology has increased the storage and access of information; likewise misinformation or misuse of information can also occur more readily. Have you ever had a billing error from a computer printout corrected? What about the home computer buffs who are connecting into government and business databanks?

Evaluation:

1. Students may write for information from the sources to verify state or federal regulations regarding privacy.

Bibliography:

Innovations: The Social Consequences of Science and Technology Program, B. S. C. S. Kentall Hunt Publishing, 2460 Kerper Boulevard, Dubuque, Iowa 52001. 1983.

Arlene F. Gallagher, Strategies For Law - Focused Education: The Methods Book, Law In American Society Foundation, Chicago, ILL 60614, 1978.

Title: Nuclear Power Issues

Guideline Code: 1g: meld of science and social studies
1h: relevance to students
1.2 balanced view

Grade Level: 7-12

Contributors: James K. Shillenn
College of Engineering
Pennsylvania State University
University Park, PA

John R. Vincenti
Institute for Research on Land/Water Resources
Pennsylvania State University
University Park, PA

Objective: The student will consider the major issues and arguments facing nuclear power and state his/her position.

Procedure: The students will read the material concerning the major issues surrounding nuclear power. Both the social studies and science teachers could be involved in the teaching of this lesson, incorporating the scientific and sociological aspects. Following this study, the students can be asked to write a position statement(for,against, undecided) nuclear power, giving reasons for their decision.

Evaluation: Written position statements

Bibliography:

James K. Shillenn, Nuclear Energy: A Resource Guide, Energy Education Programs, College of Engineering, Pennsylvania State University, University Park, PA 16802

John R. Vincenti, Energy Information: A Study of Energy in the Social Sciences, PIER Program, Pennsylvania State University, 321 Sackett Building, University Park, PA 16802.

Major Issues and Arguments

Issue # 1: Nuclear Safety[1]

Basis for Concern: In the fission process large amounts of radioactive fission products are produced. Safety systems have been designed in order to prevent the accidental escape of these fission products into the environment. The public concern is whether or not these systems will work and protect the public from significant radiation exposure due to a serious commercial reactor accident.

Nuclear Advocates Say:[2] The excellent safety record of the nuclear power reactors to date demonstrates the safety of nuclear power. Even

with the Three Mile Island accident (the most serious commercial nuclear reactor accident) no member of the public has ever been killed or injured because of a nuclear power plant accident. Improvements in safety designs over the years, with redundant backup systems and defense in depth concepts used in reactor safety systems, makes the probability of a major accident extremely small as demonstrated in WASH-1400.[3]

Nuclear Adversaries Say:[4] Even though there has not been a catastrophic nuclear plant accident, there have been many close calls and its only a matter of time before one of these problems result in a single nuclear accident that could result in thousands of deaths and injuries and contaminating a land area the size of Maryland. Small deficiencies in many areas of a nuclear plant combine to make the system unsafe. The numbers given by WASH-1400 for long term latent cancers and genetic defects for a particular accident were underestimated by a factor of 50.[5]

Issue #2: Health Impact

Basis for Concern: There are several different operations in the production of electricity from nuclear power that can result in radiation exposure to members of the public. This series of operations is referred to as the Uranium Fuel Cycle which includes mining and milling, fuel enrichment, fuel fabrication, power production, and radioactive waste disposal.

Nuclear Advocates Say: Radiation exposure to the public from nuclear power production is small when compared to exposure from natural background radiation. The health effects of nuclear power are less than the health effects of other energy alternatives such as coal.

Nuclear Adversaries Say: There is no safe level of radiation exposure. The health comparisons between nuclear and coal-fired generators

focus on emissions from the stack of coal-fired generators ignoring hazardous radiation releases from other parts of the fuel cycle.

Issue #3: Nuclear Waste Management

Basis for Concern: Radioactive waste is the inevitable by-product of the generation of electricity by nuclear reactors. The intensity of the radioactivity present is very high. Immediately at reactor shutdown, a ton of spent fuel contains about 300 million curies of activity. Commercial waste is presently being stored as spent fuel assemblies, most of it in water-cooled facilities at the reactor sites where it was generated.

Nuclear Advocates Say: There are several adequate technical alternatives for storage of nuclear waste. If the spent fuel now being stored at the reactor sites were reprocessed, the more troublesome and longer lived radioactive species could be spearated and reused for energy production, while the volume of the radioactive waste material to be stored would be reduced considerably. The most suitable repository for long term radioactive waste storage is in stable geologic formations which are known to have been unchanged for thousands or millions of years.

Nuclear Adversaries Say: There is no agreed upon safe way to isolate radioactive materials from the environment for thousands of years, a time span longer than human civilization. Nuclear storage facilities have had a hard time protecting wastes from the environment for even a decade. Radioactive wastes are a dangerous end to the fuel cycle, they are toxic. Once released into the environment they contaminate land and water virtually "forever."

Issue #4: Economics of Nuclear Power

Basis for Concern: The consumer is experiencing increases in the costs of nuclear power plant construction and electricity produced by nuclear power plants.

Nuclear Advocates Say: The cost of all forms of energy is growing and nuclear power is still the best bargain for producing electricty in most parts of the country when all factors are considered. Costs for nuclear power could be reduced if regulatory delays were reduced and if the Nuclear Regulatory Commission would streamline the licensing process for nuclear power plants.

Nuclear Adversaries Say: The cost of nuclear power is growing at a faster rate than other energy alternatives due to the rising cost of construction and operation, and low capacity factors. The nuclear industry would not have developed without enormous government subsidies.

Issue #5: Need for Nuclear Power

Basis for Concern: Conservation and other energy sources such as solar, geothermal, fusion, etc. may be able to replace nuclear power. Presently it is unclear whether or not these sources will be able to provide enough energy to satisfy energy needs in the face of diminishing fossil fuel resources.

Nuclear Advocates Say: Although conservation will help reduce energy growth there still will be a need to further develop existing energy technologies such as nuclear power to provide energy needs while other energy technologies are being developed. Even with a large national committment to new energy technology research it will take 20-30 years for successful development and commercialization.

Nuclear Adversaries Say: There is no need for nuclear power. With immediate changes in America's energy wasteful lifestyles enough energy can be saved to make nuclear power unnecessary. If nuclear power development were curtailed or stopped entirely and the same funding applied to development of alternatives, such as solar energy, these energy alternatives could begin producing a significant part of the U.S. energy supply in a very short period of time.

Issue #6: Nuclear Proliferation

Basis for Concern: Nuclear reactors use fissionable uranium and produce plutonium. If properly processed, these materials can be used to produce nuclear weapons.

Nuclear Advocates Say: In today's world any country that wants to develop a nuclear weapon can do so with or without a commercial nuclear power industry. Thus far, nations who have developed nuclear weapons have done so by easier and faster means than processing fuel from a commercial reactor. Participation in international agreements and having adequate amounts of energy available for economic growth are the only ways of reducing the spread of nuclear weapons.

Nuclear Adversaries Say: The spread of commercial nuclear power technology can only lead to more countries developing nuclear weapons. Due to the proliferation of atomic reactors, about 30 countries have plutonium that could be used in bombs. Half of these countries have refused to sign the 1970 International Treaty on Non-Proliferation, thus exempting them from even the limited oversight of the IAEA.[6]

In addition to the major issues, some other isses that energy educators should be aware of which often become part of the nuclear debate include nuclear reactor siting, Price-Anderson Act,[7] terrorism, decommissioning of nuclear reactors, availability of uranium supplies, transportation of nuclear materials, breeder reactors, licensing and regulation of nuclear power plants and other nuclear facilities, morality of nuclear power, "hard" versus "soft" energy technologies and issues of importance to the local community.

Classroom Resources

In developing a strategy for presenting these nuclear issues in the classroom there are a variety of available resources that the classroom

teacher can use. These resources vary from a one year course on nuclear science[8] to classes designed by other teachers, such as debates,[9] simulations,[10] creative dramatics,[11] and others.[12]

[1] For purposes of this discussion in this paper, a format of a statement of the issue followed by advocates' arguments and then adversaries' arguments has been arbitrarily established with no intent to make either set of arguments more favorable by its order in the paper.

[2] Nuclear advocate arguments can be found in a variety of books and articles, for example, F. Hoyle and G. Hoyle, Commonsense in Nuclear Energy (Freeman, San Francisco, 1980).

[3] "Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants," 9 Vols., U.S. NRC Report, WASH-1400, NUREG-75/014, October, 1975.

[4] Nuclear adversary arguments can be found in a variety of books and articles, for example, A. Gyorgy, No Nukes: Everyone's Guide to Nuclear Power (South End Press, Boston, 1979).

[5] Reference 15, p. 115.

[6] International Atomic Energy Agency.

[7] When nuclear power began to emerge in the U.S., Congress was concerned with providing insurance protection to the public and limiting the liability of the nuclear industry in the event of a major nuclear accident. To accomplish these purposes, the Price-Anderson Act was enacted in 1957 and renewed for the second time in 1976.

[8] See, for example, Nuclear Science (Pennsylvania Department of Education, 1977).

[9] See, for example, P. B. Hounshell and G. M. Madrazo, Jr., "Debates: Verbal Encounters in the Science Classroom", School Sci and Math 79 (8), 690-94 (1979).

[10] See, for example, P. Maxey, "Teaching About Nuclear Power: A Simulation" Soc Stud Rev 19 (2), 43-46 (1980).

[11] See, for example, I. Blair-Clough and B. Wheeler, "In the Shadow of Three Mile Island", Instructor 89 (2), 115-16, 118, 120 (1979).

[12] See, for example, R. Parker, "Radiation and the Environment: A Relevant Course on a Topical Subject", J. Chem. Ed. 54 (7) 435 (1977).

Title: Low-Level Radioactive Waste: Social, Scientific, and Economic Issues.

Guideline Code: 2 a-g: Gathering Information

Grade Level: 7-12

Contributors:
James K. Shillenn
College of Engineering
Pennsylvania State University
University Park, PA

John R. Vincenti
Institute for Research on Land/Water Resourc
Pennsylvania State University
University Park, PA

Objectives: The student will be able to:
define low-level radioactive waste.
study federal and state regulations.
identify waste generators in society.
discover health and safety issues.

Procedure: The students will read the Low-Level Radioactive Waste Factsheet[1] and review the Low-Level Radioactive Waste Overview[2] booklet. After review of this material, resource speakers might be invited to share additional information and viewpoints; such as a science teacher, state department of energy official, anti-nuclear advocate.

Evaluation: Each student will be asked to state his/her position relative to low-level radioactive waste disposal at the completion of study.

Bibliography:

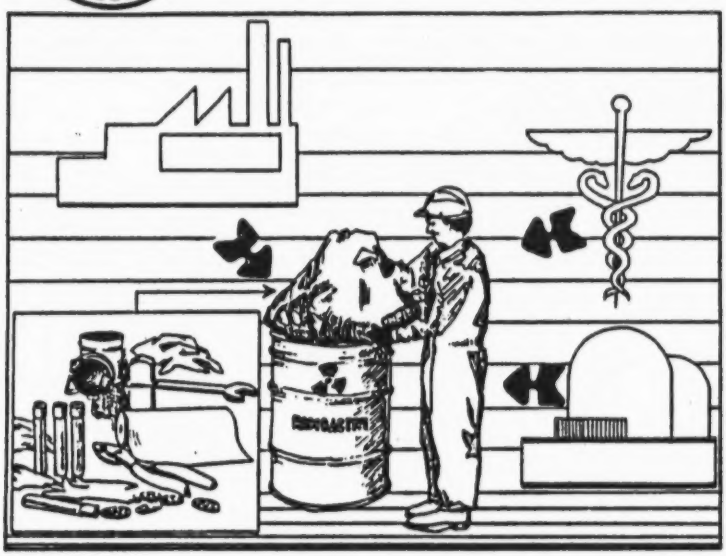
1. "Low-Level Radioactive Waste Factsheet", Institute for Research on Land and Water Resources, 321 Sackett Building, University Park, PA. 16802.

2. Low-Level Radioactive Waste Overview, PIER Program, Pennsylvania State University, 321 Sackett Building, University Park, PA 16802.

James K. Shillenn, Nuclear Energy: A Resource Guide, Energy Education Programs, College of Engineering, Pennsylvania State University, University Park, PA 16802.

John R. Vincenti, Energy Information: A Study of Energy in the Social Sciences, PIER Program, Pennsylvania State University, 321 Sackett Building, University Park, PA 16802.

LOW-LEVEL RADIOACTIVE WASTE (LLRW) FACTSHEET



WHAT IS LOW-LEVEL RADIOACTIVE WASTE?
The term "low-level radioactive waste" serves as a general term for a wide range of radioactive materials. It is usually in the form of paper, rags, resins, filter elements, instruments, machine parts, tools, and trash, including glassware, gloves, and shoe covers.

WHO DETERMINES THE CLASSIFICATION OF RADIOACTIVE WASTE?
The United States Nuclear Regulatory Commission has developed a classification system and safety requirements for LLRW. These requirements are found in the Code of Federal Regulations, Chapter 10, Part 61.

WHAT IS THE DIFFERENCE BETWEEN LLRW AND OTHER TYPES OF RADIOACTIVE WASTES?
Under federal regulations LLRW is defined as all radioactive wastes EXCEPT: 1) spent fuel from nuclear reactors which is categorized as high level waste based on the amount of radioactivity; 2) defense waste from the federal government; 3) artificially produced elements that are radioactive; and 4) waste produced from the mining and milling of uranium.

WHERE DOES LOW-LEVEL RADIOACTIVE WASTE COME FROM?
It is produced by more than 20,000 companies; hospitals; medical, educational, and research institutions; private and governmental laboratories and facilities involved in the nuclear fuel cycle, including nuclear power plants and fuel fabrication plants in the United States.

IS LLRW VERY RADIOACTIVE AND DOES IT REQUIRE SPECIAL HANDLING?
For the protection of our environment and humans working near radioactive materials, care should always be taken, but low-level radioactive waste typically requires moderate to no shielding from direct radiation and generally has moderate to low concentrations of radionuclides.

WHY IS LLRW AN ISSUE?
By January 1, 1986, all states must provide for disposal of low-level radioactive waste for nuclear waste producers within their states. This was part of the federal government's Low-Level Radioactive Waste Policy Act of 1980, Public Law 96-573.

WHAT IS CURRENTLY BEING DONE WITH LLRW?
Three commercial facilities are open and licensed to receive LLRW: Beatty, Nevada; Barnwell, South Carolina; and Richland, Washington. The governors from two of the states in 1979 urged that additional regional disposal sites be developed, so that their states would not indefinitely assume full responsibility of the nation's low-level radioactive waste disposal.

HOW CAN LLRW BE DISPOSED OF SAFELY?
Site selection is an important part of the safe disposal of LLRW. Site selection includes consideration of topography, groundwater conditions, geologic features, and soil characteristics. Good engineering and monitoring further protects the environment and public health and safety. There are two different methods of disposal: above-ground and below-ground with varying techniques depending on the site.

Title: Science, Technology, and Health

Guideline Code: 5.0 Problem Solving

Grade Level: Junior and Senior High School

Contributor: Faith M. Hickman
University of Colorado
Boulder, CO

Objective:

The student will encounter and interact with science, social issues, and personal concerns related to a health issue.

Procedure:

The Manville story which follows is a real-life situation taken from available newspaper and magazine accounts. Additional resources can be an attorney, public health worker, economist, scientist, social scientist, manufacturer, or consumer advocate. The material may be presented to students through their own reading, a summary written by the teacher at their reading level, or by the account being read to them. After study of the health issue, students might be asked to respond to the follow questions:

a. Did Manville ignore health risks known about fifty years ago, opting for short-term gain over long-term responsibilities?
b. Was the government choosing expedience over safety in regulations established during World War II?
c. Does ignorance exonerate?
d. Does hindsight inform the future?
e. Is this issue more complex than you imagined?
f. Who do you believe was right or wrong is this case?

Students may form debate groups in class or vote on the different conclusions suggested by classmates. The teacher should focus student attention on the multidimensional facets of abestos product technology within a context maze of economics(Manville's profit/loss), political (shipbuilding in World War II), social(workmen's compensation), and historical(past, present, future) dilemmas. Science-based questions of social and public policy continue to dominate our political agenda whether it be consumer protection for automobile safety or medicine and food substances. In order to develop an informed citizenry, teachers need to expose students to science-related social issues in the classroom.

Evaluation: Have students react to questions posed in the above procedure, being careful not to judge their response as right or wrong, but focusing importance upon a student's ability to make a decision and provide support for the reason.

Bibliography: The Manville story for this lesson was abstracted from a paper"A Case Study in Curriculum Design" published by Faith Hickman in the 1984 Yearbook of the National Science Teachers Association with their permission.

The Manville Story

On August 27, 1982, the Denver-based Manville Corporation, a giant building materials conglomerate long the nation's largest manufacturer of asbestos, made front page news with its declaration of bankruptcy (Pitts, 1982a and 1982b). Insisting that business was good and the company solid, Manville became the largest American industrial company ever to file for bankruptcy. Manville made its unprecedented move despite $2.2 billion in sales in 1981 and a "healthy net worth of 1.1 billion" (Marback, et al., 1982). Why should bankruptcy be sought by such a company?

> It wasn't financial insolvency, the company said, that drove the giant building materials manufacturer and asbestos producer to seek protection through the courts for itself and 20 subsidiaries.
>
> It was the mounting, asbestos health-related lawsuits, which could eventually total 52,000 and a possible liability of $2 billion (Pitts, 1982b).

Claiming to be "completely overwhelmed" by the number and magnitude of the suits filed against it, Manville sought the "Chapter 11" (reorganizational) bankruptcy in order to freeze all pending asbestos-related suits and to prevent new ones from getting started. With lawsuits being filed against Manville at the rate of 500 a month, and with an existing caseload of 16,500 suits (Marback et al., 1982), Manville's move was no minor action.

The past, present, and future damage claims against Manville all came from a single source: asbestos. The health risks of asbestos have received a great deal of attention within the last 15 years and Manville, the largest manufacturer of asbestos in the non-Communist world, has, since 1968, dealt with 20,000 lawsuits and paid out $50 million in claims (Kelley, 1982).

Because asbestos does not burn, it has been used extensively to make fire-resistant building materials, to line the walls of homes, schools, and

businesses and to insulate pipes and machinery. Asbestos is made up of tiny, strong, needle-like fibers that are light enough to be inhaled. Therein lies the difficulty, for asbestos fibers in the lungs can cause several kinds of disease: asbestosis, a chronic respiratory disease similar to emphysema; mesothelioma, a lethal cancer of the chest or abdominal lining; and lung cancer. But these fatal diseases take as long as 20 to 40 years to develop, with the result that large numbers of workers who handled asbestos during World War II and even before were not diagnosed until the late 1960s (Kelly, 1982).

The history of the Manville bankruptcy can be traced at least as far back as 1929 (Pitts, 1982d). In that year, Manville and another U.S. asbestos manufacturer became aware that an English physician had described a fibrotic disease in an asbestos worker and had coined the term asbestosis. These companies then commissioned the Metropolitan Life Insurance Company to study asbestos workers. In 1930, another British study noted that asbestosis was frequently found among workers in English textile mills. In 1931, Manville initiated a dust control program in its plants. In 1933, Manville settled its first asbestos-related lawsuit. Manville paid $35,000 to eleven New Jersey plant workers who claimed to have contracted asbestosis as a result of their employment with Manville.

On January 4, 1935, the U.S. Public Health Service published the results of the Metropolitan Life Study. In 1938, the Service established "safe" standards for asbestos dust exposure. The American Conference of Governmental Industrial Hygienists adopted that standard of 5 million particles per cubic foot, eight hours per day, 40 hours a week for a working lifetime. In 1946, an epidemiological study found three cases of asbestosis among 1,074 pipe coverers over 20 years and concluded that "pipe covering is not a dangerous occupation." The study pointed out, however, that pipe coverers might have a lower exposure than asbestos workers and that the incidence of asbestosis

among factory workers might be considerably greater.

In 1960, South African doctors linked mesothelioma to asbestos exposure. In 1964, a research team at Mount Sinai Hospital concluded that insulation workers face significant risks and that the standards previously established were not stringent enough. The Mt. Sinai study also concluded that there should be virtually no lung cancer associated with asbestos exposure in non-smokers. In 1971, the Occupational Safety and Health Administration set new standards and in 1972 began requiring caution labels on asbestos materials. In 1973, Manville stopped producing most of its asbestos-containing insulating material.

In 1975, the "litigation race" began. In that year, 72 suits were filed and in 1976 another 156 were initiated. In 1977, 359 were filed. In 1978, 794. Another 1,714 in 1979; 2,777 in 1980; 4,761 in 1981; and 3,049 more new suits by August of 1982. In 1977, a bill was introduced in the House of Representatives that would have established a trust fund to compensate victims of asbestos-related diseases. The bill failed. A similar measure introduced two years later in the Senate was also defeated. In 1978, Manville instituted a smoking ban in all its asbestos plants. Three unions filed grievances. Two lost, but the International Association of Machinists won at Manville's Denison, Texas, pipe plant. Now smoking rooms are reserved for employees hired before the ban, but new employees must accept company policy.

In 1979, the auditors got into the game, for the first time adding a rider of potential liability to the company's annual financial statement. In 1982, a Texas jury decided against Manville and awarded $1.06 million in compensatory damages and another $1 million in punitive damages. In April of 1983, Manville reported its first quarterly loss since the Depression and that same month commissioned a Boston firm to determine its potential liability

from lawsuits. The Manville Board of Directors determined, only a few months later, that bankruptcy was the only way to obtain protection from creditors and stave off impending disaster.

In October, 1982, Manville reported earnings in the third quarter nearly double those of the same quarter in 1981. The company attributed the turnaround to "down-sizing" the company in 1982 and to the relief provided by the Chapter 11 filing (Pitts, 1982f). In November, Manville initiated a new half-million dollar advertising campaign on the theme "our new world is full of promise." The campaign was designed to communicate the company's strength to customers and employees. The ads appearing in newspapers and magazines across the country offered this justification of the bankruptcy filing: "If you're a Manville creditor--including one who suffers from an asbestos-related disease--it promises you the fairest treatment of your claim" (Pitts, 1982g). Third quarter gains could not, however, overcome the effects on the building industry of a sagging economy. Manville reported a loss of $97.6 million in 1982 (Pitts, 1983b). Much of the loss was attributable to problems and actions unrelated to the asbestos controversy. But Manville continued to feel the effects despite the Chapter 11 filing. Asbestos health costs were up $4.6 million in 1982 to $16.1 million, including $3.6 million for continuing legal expenses in the fourth quarter. As of January, 1984, Manville's bankruptcy petition was still tied up in court. Judge Burton Lifland commented, "I have the feeling we will have to live with Manville forever, even if it (the case) is dismissed" (Pitts, 1984).

Sorting Through the Manville Controversy

Much of the reason for the recalcitrance of the Manville issue rests with the difficulty of assigning responsibility. After the filing of the bankruptcy petition, the newspapers were full of claims and counterclaims,

most revolving around a single question: Who's to blame?

Senator Gary Hart (D-Colorado), asserting that the present system of suing does not work equitably, has written a bill establishing the concept of "responsible parties" to pay for asbestos-related illness and death. Unlike an industry supported bill calling for a 50-50 split between government and industry, the Hart bill would require industry to pay in most all cases, with the federal government paying some part of the damages only in certain instances (Schmidt, 1982a).

Manville blames the federal government to a much greater extent--because fully half the pending suits are from civilian workers employed in U.S. Navy shipyards during World War II, where Manville had no control over working conditions (Pitts, 1983b). Maintaining that Manville is not seeking a "government bailout," company officials assert instead that it is the government that needs a bailout "from the moral view." Manville Chairman John A. McKinney:

> They (the Public Health Service) controlled the shipyard environment. After World War II the Navy said that ship-building was not a hazardous occupation. Then since the disease developed, the government has failed to accept any responsibility . . . . If there is one satisfaction I can take in this (bankruptcy filing) it's that finally people--like the New York Times editorial this morning--are saying it's time government did something (Pitts, 1982c).

There is, of course, the corollary argument that government responsibility is really taxpayers' responsibility. After all, the makers of asbestos and the shipyard workers of World War II were serving the public interest--so the people, through the federal treasury, should ultimately bear the responsibility. The "human cost" is a matter of public concern (Pitts, 1982e). Opponents of this argument are quick to retort that opening the treasury to Manville would presage opening the public coffers to every other manufacturer

of a hazardous product (Schmidt, 1982b).

Manville believes that the federal government is not the only party ducking its fair share of responsibility. Manville and several other asbestos manufacturers have a three-year-old lawsuit awaiting hearing in California courts against a number of insurance cariers. The issue is which carrier is responsible for which claims--the insurer at the time that the claimant was exposed or when the symptoms actually appeared (Pitts, 1983a). Simultaneous with its declaration of bankruptcy, Manville filed an amendment to that suit for an additional $5 billion in punitive damages. Manville charges that their insurance carriers wrongfully rejected asbestos claims, forcing the bankruptcy filing. These denials of coverage "so damaged Johns-Manville's (a subsidiary) operations and cash flows and so strained its financial resources that reorganization proceedings had to be commenced ("Insurance Firms Manville Target", 1982).

Curtis Linke (1982), vice president of corporate relations for Manville, suggests that "generally accepted accounting procedures" are to blame:

> As a consequence of the expanding burden of asbestos litigation, our auditors . . . qualified their opinions on our 1980 and 1981 financial statements. We were informed that this qualification could not be removed until the potential liability of asbestos health litigation could be quantified and reserved for . . . . No matter that some of these liabilities may not be incurred immediately; accounting rules absolutely require us to reserve immediately for the reasonably probable amount. And that amount . . . would be more than $2 billion, effectively eliminating our net worth.
>
> The corporation's resulting balance sheet would have made it difficult, if not impossible, for the company to function in normal credit markets . . . . In essence, we would have been destroying our healthy businesses, and with them the prospects for recovery by all creditors, including asbestos claimants, just to keep the company afloat.

Others blame our nation's "hodge-podge product liability justice system." An editorial appearing in The Denver Post only three days after the

bankruptcy filing was titled "Manville's Dilemma." Unsigned, the brief statement suggested that Manville had done the only thing it could to draw attention to the disgraceful state of corporate liability law in the United States. The Post argued that a company should be liable only for "danger clearly known to the manufacturer at the time of the dangerous act. The legal system should allow for some sort of consolidation of claims so that they can be met by reasonable legal and settlement expense." The editorial concludes that putting a big company out of business in the face of "tenuous or magnified product liability claims" is just as wrong as absolving a manufacturer of any responsibility at all.

Paul Rheingold (1982), a New York trial lawyer who handles litigation for injuries from environmental exposures, disagrees that "toxic tort" law is to blame. He suggests, instead, that workmen's compensation systems have not handled the problem as well as they should have. Payments were reduced or totally lost because some of those injured were not employees of a company, because the laws cover accidents but not long-term illnesses, and because the compensation programs pay only a fraction of the real cost of asbestos-related illness and death. But Rhenigold is not inclined to let Manville off the hook entirely. He would like to see trust funds created with money from Manville, cigarette companies and manufacturers of other products "which in some workers were co-factors in the production of lung disease."

Other parts of the law may also be to blame. On June 28, 1982, the Supreme Court found the 1978 Bankruptcy Act unconstitutional and ordered Congress to rewrite bankruptcy legislation. The Congress missed one court deadline in October of 1982 and another on Christmas Eve of the same year. Why? Because of battles between a high-powered coalition of creditors who

want to make bankruptcy more difficult and to force debtors to pay more of what they owe as opposed to consumer groups who wish to protect individuals and small businesses. Whether the bankruptcy laws are too lenient and whether Manville misused them in seeking relief from responsibility for asbestos-related death and disability are still hotly contended issues.

It is possible to assign culpability even more broadly to the entire system of private enterprise. There are those who predict that Manville's action will have a "domino effect," spreading not only to other asbestos manufacturers but to the creditors of those manufacturers as well (Associated Press, 1982a). Rheingold (1982) suggests that Manville may have ignored or underestimated the health threat of asbestos, presumably operating under a motive of short-term profit over the possibility of long-term loss. Advocates of big business defend the system--and Manville--in colorfully persuasive terms:

> An old cartoon shows a sadistic character holding a whip over the body of a house cat. The cat, in full harness, has been trying to drag a grand piano up a flight of stairs. In the caption, the character says: "Damn cat died."
>
> That cartoon summarizes the attitude of many lawyers and lawmakers toward Manville Corporation . . . . It makes no difference that the hazards were largely unknown, or that Manville followed government-approved safety standards at the time. It makes no difference whether the firms that later installed the asbestos let fibers blow around like sawdust in a butcher shop. It makes no difference that if for some reason Manville had refused to do business with the U.S. Navy its asbestos would have been promptly requisitioned. Manville is the biggest private company in sight, and Manville must pay . . . . Judges . . . have come up with doctrine of 'deep pockets' which in practice means finding and sticking the richest company around (since the government is so hard to sue). This is no more and no less defensible, morally, than making Sears provide free merchandise to the victims of house burglars ("Not Such Deep Pockets", 1982).

Perhaps in the final analysis blame must be laid at the feet of that greatest of all human enemies: time. Asbestos is now recognized as the largest single source of occupational cancer. Studies in the 1930s that implicated

asbestos in lung disease and cancer did not find corroboration until the early 1960's when evidence began to accumulate on disorders that had been twenty or thirty years in the making. It is now estimated that somewhere between 10 and 20 million people have been exposed to asbestos fibers over the last four decades. There is no general agreement about how much asbestos over what period of time constitutes a substantial health risk; but one government pamphlet warns that "just one month of working with asbestos can double your chances of getting cancer." Researchers at Mt. Sinai now predict that 5,000 asbestos-caused cancer deaths will occur annually between now and the year 2000. Another group of scientists foresees, for those exposed to asbestos before 1965, an impending 150,000 cancer deaths--"most of which have yet to occur" (Russell, 1982). Did Manville know of the risk and fail to take appropriate action? Would informing workers of health risks (which Manville failed to do) have been sufficient? Could Manville have predicted the load of future illness and death it was incurring forty years ago? Even if it could have, could Manville have influenced the Navy to use some materials other than asbestos in its shipbuilding? How can industry adequately predict and control for health threats that may be a lifetime in the making? These and other questions will undoubtedly be debated as the Manville issue continues in the years to come.

REFERENCES

1. Associated Press. "Manville Creditors Worry About Domino Effect." The Denver Post P. F1; 10 September 1982.

2. "Insurance Firms Manville Target." The Denver Post p. H1; 28 August 1982.

3. Kelly, J. "Manville's Bold Maneuvers," Time, 2 September 1982.

4. Linke, C. G. "Action Should Help Everyone Who has Claims on Manville." The Denver Post p. 3B; 19 September 1982.

5. Marbach, W. D., Copeland, J. B., Cook, W. J., Foltz, K., & McAlevey, P. "An Asbestos Bankruptcy." Newsweek pp. 54-57; 6 September 1982.

6. "Not Such Deep Pockets." National Review p. 1124; 17 September 1982.

7. Pitts, G. "Despite Filing, Business Proceeds." The Denver Post p. A1; 27 August 1982. (a)

8. Pitts, G. "Manville Seeks Reorganization: Says Asbestos Lawsuite Key to Decision." The Denver Post p. A1; 27 August 1982. (b)

9. Pitts, G. "Chairman Denies Manville Taking 'easy way out'." The Denver Post; 28 August 1982. (c)

10. Pitts, G. "Lawyer, PR Firm Took Asbestos Cases Public." The Denver Post; 24 September 1982. (e)

11. Pitts, G. "Manville Earnings Double '81 Quarter." The Denver Post; 30 October 1982. (f)

12. Pitts, G. "Manville Campaign To Back 'Promise'." The Denver Post; 14 November 1982. (g)

13. Pitts, G. "Manville Asks Judge for Estimate of Liability." The Denver Post; 5 February 1983. (a)

14. Pitts, G. "Manville Lost $97.6 Million in '82". The Denver Post; 25 February 1983. (b)

15. Pitts, G. "Ruling On Manville Expected This Month." The Denver Post; 6 January 1984.

16. Rheingold, P. D. "It's a 'Sham Attempt' to Prevent Lawsuits by Asbestos Workers." The Denver Post p. 3B; 19 September 1982.

17. Russell, C. "Manville Plea Blocks Widow's Suit." The Denver Post p. 1H; 28 August 1982.

18. Schmidt, A. "Hart Urges Fairer Asbestos Payments." The Denver Post; 28 August 1982 (a).

19. Schmidt, A. "U. S. Opposes Asbestos Fund Help." The Denver Post 1F; 10 September 1982. (b)

Title: Science/Society Issues in Current Events:News and Nukes

Guideline Code: 2.g. Gathering Information
3.d. Processing Information
4.1c,d. Evaluating Information

Grade Level: Secondary/post secondary

Contributor: Jacob L. Susskind, Pennsylvania State University--Capitol Campus, Middletown, PA.

Objective: The student will gather and analyze information reported in the media on a science-related social issue.

Procedure: The teacher will select a continuing event. For example, the accident which happened at Three Mile Island in 1979 can be used as a case study to analyze newspaper coverage. Using the daily newspaper, students will trace the news story over a period of time. They will note page location, position on the page and space allotted to the story each day. Students will clip and mount the news articles. They will note the size of type and length of headlines. Are they appropriate, misleading or slanted? Students will inquire about the writer's qualifications. Does s/he show a personal bias? Students will suggest and teacher will list "loaded" words. Teacher will make a list in two columns of fact and opinion. See material following, "News and Nukes".

Evaluation: Evaluation will be based upon student product (clipping) and participation in discussion.

Bibliography:

Heitzmann, William Ray. The Newspaper in the Classroom. Washington, D.C. National Education Association, 1979.

Nesbitt, William A. Interpreting the Newspaper in the Classroom: Foreign News and World Views. New York: T. J. Crowell, 1971.

Susskind, Jacob L. "Using Pennsylvania's Three Mile Island Accident as a Case Study to Analyze Newspaper Coverage," Social Studies Journal (Pennsylvania Council for the Social Studies) 12 (Spring, 1983) 51-61.

NEWS AND NUKES: USING THE THREE MILE ISLAND ACCIDENT AS A CASE STUDY TO ANALYZE NEWSPAPER COVERAGE

After the nuclear power plant accident at Three Mile Island, there was much criticism of the manner in which the news media covered the event. One critic said that the media exagerated the whole thing. Another charged the media people with "misrepresenting and sensationalizing" the accident. A third described news reporting of the accident as "one of the most signal disasters of American journalism in years."[1] Teachers of social studies who rely on honest and accurate news reporting for their study and understanding of current events must be taken aback by such charges. If these accusations are correct, then we need to revise our approach to teaching about current affairs using the newspaper.

To explore the validity of these charges, I examined the front pages of four newspapers for two weeks following the accident at Three Mile Island. The newspapers were the Harrisburg Patriot, the Philadelphia Inquirer, the Washington Post and the New York Times. These newspapers were selected because of their proximity to the accident and their relative importance in reporting national and international news events. To analyze the news, I compared the content of headlines and articles in each of the newspapers. Differences and similarities were noted. In what follows, I will relate my analysis of newspaper coverage with my thoughts and actions during the two-week period following the accident at Three Mile Island.

On March 28, 1979, there occurred at Three Mile Island (three miles from my home in Middletown, Pennsylvania) an accident which reverberated around the world. It was no ordinary noise which awoke nearby residents at four in the morning. The boom which sounded that Wednesday was the shock of the worst commercial nuclear reactor accident in United States history. This accident would have world-wide ramifications for the future of nuclear power. It would affect the lives of people everywhere, not only those who lived nearby on the banks of the peaceful Susquehanna River.

March 29. I read the common word in the Patriot, "Radiation Being Vented." Throughout the day, I heard reports on radio and television. Still, I had scant knowledge about the extent of the accident. Moreover, I was unfamiliar with the technical jargon used to describe the incident. Much to my chagrin, I read reports which did little to enlighten me or calm my concerns. I knew little more than that something was amiss and that it had the potential for catastrophe. Thus were we kept on the brink of nuclear disaster for the next few days.

March 30. Friday. The expectation of a relaxing weekend has faded into the worried atmosphere which erupted yesterday. The newspapers report that redistion continues to be emitted from TMI-2. Metropolitan Edison, the company which operates TMI, said that they were purposefully releasing radioactive gas and steam to relieve pressure inside the plant. Government officials were in a quandary about what steps to take to insure the public health and safety. Governor Dick Thornburgh said, "There is no

cause for alarm."[2] At The Pennsylvania State University--Capitol Campus (where I teach) classes were suspended for the week. On my campus, a meeting conducted by professors of engineering disbanded when one of them compared the amount of radiation being released to a dental x-ray.

March 31. Today, the headlines linked the words meltdown and evacuation. Coincidentally, a local movie theater is showing "The China Syndrome," the movie about a fictional nuclear power plant accident. With all the confusion about the accident at TMI, my family and I left our home to stay with friends in Harrisburg, some ten miles away. The Governor suggested that pregnant women and pre-school children within five miles of TMI evacuate the area. The specter of a meltdown--a melting of the reactor's stainless steel fuel rods or the enriched uranium pellets within them--sent thousands fleeing from the area. If the experts were credible, then the problem was far worse than at first indicated. There was a remote chance of a meltdown. For many residents of Central Pennsylvania, that slim possibility was enough to send them away.

April 1. Three Mile Island is no April Fools Day prank. "Evacuation" is still in the headlines. The seriousness of the situation is underscored by President Carter's visit to the site. To get away from the danger posed by the hydrogen bubble and the anxiety in the air, my family and I head for the safety of the nation's capital. It is not easy to leave TMI behind us; we hear hourly reports on the bubble's progress. In Washington, we are greeted by kite flyers on the Mall, enjoying a spring-like

day. Back in Pennsylvania, monitors have been installed to record the accumulation of radiation. The efforts for a cold shutdown lay ahead.

April 2. News of President Carter's visit and the problematic bubble filled the front pages. Most schools in the area were closed. While the campus was dormant, feverish activity occurred at the hastily constructed trailer city nearby TMI. The Nuclear Regulatory Commission workers made progress and stabilized the situation, but the bubble persisted. The Mayor of Middletown was reported to have told his police to shoot looters on sight. A curfew, to stay potential looters, was placed into effect in the communities surrounding TMI.

April 3. "Bubble Shrinks" proclaimed the headline. The NRC remained cautiously alert as one official announced that the bubble inside the reactor was decreasing in size and may have been less potentially explosive than previously feared. Although the bubble was nearly gone, federal officials wondered if the contamination might not close the TMI plant forever. One said that it "might be a one billion dollar mausoleum."[3] With each passing day, I was becoming more skeptical of the experts. The conflicting and contradictory reports emanating from the government and corporate offices led me to growing doubt toward experts and officials. The more I heard, the less I believed. Was nuclear power needed for our energy supply? I was determined to find out.

April 4. With the reactor bubble removed, clean up efforts at the contaminated TMI plant might take from two to four years

and cost as much as forty million dollars. Although an evacuation was not ruled out, the cool down continued with the prospect that life around TMI would soon return to 'normal'. Today we read that "very small amounts" of radioactive iodine have been detected in milk samples taken from cows located in area farms.[4] A Nuclear Regulatory Commission official told about the clean up efforts: "First you drain out the dirty water, and then you scrub it down."[5] Will the communities which draw their drinking water from the Susquehanna River accept this?

April 5. Now that the immediate danger of the nuclear accident had passed, there was an assessment (doubtless one of many to come) of what occurred. The first official safety report listed human, design and mechanical factors that contributed to the accident. The TMI plant was in violation as it failed; two valves were left in closed positions before the accident happened. Meanwhile, HEW Secretary Joseph A. Califano testified before a Senate subcommittee that despite the fact he saw no additional health risk to residents of the TMI area, his department would continue to monitor radiation and conduct health studies. The assurances notwithstanding, it was difficult for me not to entertain lingering doubts about Califano's speech. After all, he is a presidential appointee and President Carter is a proponent of nuclear power.

April 6. The President continued his strong support for nuclear power in his energy speech. He proposed to form a commission to probe the TMI accident. Before the crisis was over, entrepreneurs planned how they could capitalize on the

accident. Before the reactor had cooled down, several items relating to the accident were placed on the market: the quickly produced booklet of photographs; bumper stickers; "radiation cocktails" at local bars; cans of "TMI air"; and, the ubiquitous T-shirt--"I survived TMI" and "No Nukes is Good Nukes." Is it a unique American trait which prompts commercialization (and consequent trivialization) of a horrific event such as a nuclear accident? In the wake of the occurrence also came the gallows humor--attempts to make light of and to live with the terrible truths of nuclear power. It was difficult to understand that which most folks knew only as the cooling towers or something that sounded like the name of a bomb which destroyed much of Hiroshima. In the face of uncertainty, humor can help to diffuse a tense situation. The motivation behind the T-shirts, etc., must be the same drive behind the atomic power lobby.

April 7. While the Pennsylvania newspapers headlined further leaks of radioactive gases, other papers discussed safety factors involved in the construction of the reactor. Governor Thornburgh, in a speech telecast statewide, said that he had "serious doubts as to whether the plant should ever be opened again."[6] Many citizens shared his views and were already forming political action groups to keep TMI closed. Activists were developing agendas and plans for legal action against the operators of TMI. Through print and public fora, there were the educational and informational functions of telling people what had occurred and the consequences of those events. Many local groups formed to ban nuclear power. Groups, such as People Against Nuclear

Energy (PANE) and Three Mile Island Alert (TMIA) petitioned, wrote letters, marched and demonstrated. While these anti-nuclear forces became vociferous, the pro-nuclear power lobby was trying to mend fences. The industry was threatened by the accident. Not only would this form of energy be questioned as a safe and efficient mode, but there were other ramifications of the accident which required attention. The future of nuclear power was in doubt.

April 8. This was a relatively quiet day since the accident began. Newspapers contained much analysis and reflection. In Harrisburg, an article told of the possibility of increased legislation for nuclear plant safety. The Inquirer and the Post carried stories about how the accident happened. The Post conducted a poll which revealed that most Washingtonians expected another, possible worse, accident; nevertheless, they were pro-nuclear power.

April 9. The Times reported that the TMI accident increased the public's distrust of assurances from experts on technical topics. The Pennsylvania newspapers gave prominent coverage to the Harrisburg rally against the TMI plant; other papers placed this story on the inside pages.

April 10. The top story in all four newspapers was "Crisis is Over."

With this headline, it is appropriate to stop our analysis of the coverage given by four newspapers to the story of the accident at Three Mile Island. In conclusion, our analysis suggests that, given the confusion of official statements and

their obvious groping for ways to avoid a catastrophe, the press on the whole provided responsible coverage. The newspapers described clearly the fumblings and inconsistencies of people as official stories of what was happening changed and contradicted themselves over and over again.

The techniques used to analyze an issue and how it is handled in newspapers relate mainly to three types of newspaper content: the news story, the editorial and the editorial cartoon. Most editorials reflect a timely news story. The editorial triggers an editorial cartoon, or vice versa, but each may express a different point of view. To involve students, select an issue of interest. Start by collecting news stories on the same issue from several newspapers. Follow the news story noting the day-to-day placement in the paper; note the time that elapses before an editorial is printed or an editorial cartoon appears. You may want to follow these steps:

1. Use a continuing event.
2. Trace the news stories over a period of time.
3. Note page, position and space alloted each day.
4. Clip and mount articles. Note the type and size of headlines. Are they appropriate, misleading or slanted?
5. What are the writer's qualifications? Does he/she show personal bias?
6. List "loaded" words and phrases.
7. Make a list in two columns of facts and opinions.
8. Analyze editorial cartoons which refer to the story.

By helping students to analyze and understand such continuing news stories, educators can do much to encourage positive citizenship behavior. Social studies teachers may well agree with Thomas Jefferson, who preferred a free press to a free government.

NOTES

1. John J. McDermott, "On Nuclear Education," Phi Delta Kappan 61 (November 1979): 229.
2. The New York Times (March 30, 1979): 1.
3. The Washington Post (April 3, 1979): 1.
4. The Harrisburg Patriot (April 4, 1979): 1.
5. The Washington Post (April 4, 1979): 1.
6. The Harrisburg Patriot (April 7, 1979): 1.

SOURCES OF INFORMATION

Compiled by Sara F. Anderson,
Northern Virginia Community College

SOURCES OF HELP WITH TEACHING TECHNIQUES AND METHODS.

Association for Science Education for Science Education, Science and Society, Heinemann Educational Books, 4 Front Street, Exeter, NH 03833.
Secondary school teaching units (12) with interdisciplinary focus on implications of science, industry, and technology upon society.

Biological Sciences Curriculum Study, Innovations: The Social Consequences of Science and Technology. Box 930, Boulder, CO 80306. 1982.

Charles, Cheryl and Bob Samples, Eds. Science and Society: Knowing Teaching, Learning. Washington, DC: National Council for the Social Studies Bulletin # 57, 1978.
Articles providing background on the rationale and philosophy of teaching about science-related social issues, representative issues and some practical suggestions for classroom activities.

Educational Development Center, People and Technology, 55 Chapel Street, Newton, MA 02195.
A middle school social studies program that simulates inquiry into the use of technology and its interaction with society and the environment.

Fowler, John M. Project For An Energy Enriched Curriculum, National Science Teachers Association, 1742 Connecticut Avenue NW, Washington, DC 20009.
Science and social studies teaching packets infusing energy education into the curriculum K-12.

Galbraith, Ronald E. and Thomas M. Jones. Moral Reasoning: A Teaching Handbook for Adapting Kohlberg to the Classroom. Minneapolis, MN.: Greenhaven Press, 1976.
Presents Khohlberg's theory of moral development in brief, and some generalizations about that theory. The characteristics of a moral dilemma story which will aid students in developing their moral reasoning are given, along with sample materials and descriptions of the process of conducting discussions about moral dilemmas.

Grobman, Arnold B. Social Implications of Biological Education. Washington, D.C.: National Association of Biology Teachers, 1976.
Content Articles on medical technology, populations, evolution and genetics. Grobman's introduction is a rationale for teaching about biology-related social issues.

Hickman, Faith M. and Jane Butler Kahle. New Directions in Biology Teaching. Reston, VA.: National Association of Biology Teachers, 1982.
Several informative articles about the place of controversies and values in high biology courses. Content articles on science and public policy, genetics and human reproduction.

Howe, Leland W. and Mary Martha Howe. Personalizing Education: Values Education and Beyond. New York, N.Y.: Hart Publishing Company, 1975.

Provides and introduction to the values clarification approach to education in the affective domain, and a wealth of activities and work-sheets for classroom use. Some of these activities have been criticized for invading students' privacy and should be used with caution or modified.

Johnson, David W. and Roger T. Johnson. Learning Together and Alone: Cooperation, Competition and Individualization. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1975.

Suggestions for devising objectives and activities which will encourage cooperation among students and allow more individualized instruction. Excellent. Appendices include reviews of research on the effectiveness of teaching methods which stress cooperation and exercises to use to assess students' willingness to cooperate. Bibliography.

Kohlberg, Lawrence. The Philosophy of Moral Development. v. 1 of Essays on Moral Development. New York, N.Y.: Harper and Row, 1981.

Most of the articles have been published in journals, but in this volume they are collected into one place. Includes reports of Kohlberg's and others' research on moral reasoning and on reasoning about political and juridical issues.

Kurfman, Dana G. Developing Decision-Making Skills. 47th Yearbook of the National Council for the Social Studies. Washington, D.C.: N.C.S.S.: 1977.

Introductory articles on the process of decision-making and on thinking skills. Practical suggestions for teaching reading in the social studies, teaching decision-making skills in elementary schools and in high school social studies classes. Final article contains instruments to use to evaluate student progress in various types of decision-making situations. Notes at end of each article.

Metcalf, Lawrence E., Ed. Values Education: Rationale Strategies and Procedures. 41 Yearbook of the National Council for the Social Studies. Washington, D.C.: N.C.S.S., 1971.

Presents a programmed text on the terms used in making various levels of value judgments. Articles describing a rationale for approaching controversial issues in terms of the values relevant to the issues, and specific teaching techniques for using this approach comprise most of the book. Bibliography at end of each chapter.

Muessig, Raymond H. Ed. Controversial Issues in the Social Studies: A Contemporary Perspective. Washington, D.C.: National Council for the Social Studies. 45th Yearbook, 1975.

Theoretical framework for teaching about controversial issues; some models for preparing to teach about such issues; articles discussing the place of specific topics (changing gender roles, death, and environmentalism, for example) in the public high school curriculum.

National Diffusion Network, The Environment & Technology Project, 1633 N. Burling, Chicago, IL 60614. An interdisciplinary science and social science high school curriculum in environmental education, 1982.

National Education Association. Values Concepts and Techniques. Washington, D.C.: National Education Association, 1976.

Articles by various authors on the concepts relevant to discussions of values and classroom strategies to use when dealing with many types of controversial issues. Bibliography.

National Science Programs, The Human Sciences Program, Box 41, 908 W. Wilson Street, Batavia, IL 50610

Modules developed by the Biological Sciences Curriculum Study for the middle school being interdisciplinary and designed around topics such as knowing, change, and invention.

Patrick, John J. and Richard C. Remy, "Crossing Two Cultures in the Education of Citizens", American Biology Teacher, September, 1982.

An assessment of the teaching of science and society in the curriculum and in textbooks with suggestions for infusion into the history, political science, and science curriculum at the high school.

Rogers, Carl. Freedom to Learn for the '80's. Columbus, OH.: Charles E. Merrill and Company, 1983.

A revision of Rogers' 1969 Freedom to Learn. This volume contains first-person accounts and research on the effects of giving classes more power over the content of a course. Much emphasis on cultivating effective interpersonal relationships with students as a means of enhancing their learning. Index. References at ends of chapters.

Rosenthall, Dorothy B. "A Science and Society Course for High School Students", American Biology Teacher, September, 1979, pp. 336-340.

A course outline integrating bioethics with the high school curriculum which is designed to be taught by the social studies and science teachers.

Scharf, Peter. Moral Education. Davis, CA.: Responsible Action, 1978.

This useful book contains a discussion of various views of moral education in public school classrooms, theories of development and some case-studies of various attempts to influence students' growth and development of moral reasoning skills. Including moral reasoning in the content of several subjects including social studies, science and health are included. Footnotes at ends of chapters.

Simon, Sidney B., Leland W. Howe and Howard Kirschenbaum. Values Clarification. New York, N.Y.: Hart Publishing Company, Inc., 1972.

Contains a wealth of practical suggestions for activities to use to aid students in becoming more aware of their own values and how those values influence their actions. Some of these techniques have been criticized for being invasive of student privacy; they should be used with discretion.

Switzer, Thomas and Burton Voss. "Integrating the Teaching of Science and Social Studies", School Science and Mathematics, October 1982, pp. 452-461.

This paper discusses the integration of science and social studies into the elementary and secondary schools with sample programs that are available.

Additional Sources of Information.

To obtain a bibliography of sources of information about bioethics, you can write to: The Kennedy Institute
Bioethics Library
Georgetown University
Washington, D.C. 20057

Residents and visitors of the Washington area can use the resources of the Library.

A group of teachers from private schools in New York City have formed a group, the purpose of which is to exchange ideas and information about reaching about science and society issues. Address inquiries and a request for a copy of their newsletter to

Teachers Clearinghouse for Science and Society Education
210 East 77th. Street
New York, N.Y. 10021

Local colleges and universities will sometimes extend Library borrowing privileges to teachers from the local area.

Your school district's professional library or the supervisors of science and social studies: copies of recent textbooks as well as other sources are often available from these sources.

And finally, but perhaps most importantly, the teachers of other subjects in your own school have knowledge, copies of textbooks and other sources you can tap.

PERIODICALS.

Science. Weekly journal published by the American Association for the Advancement of Science. Sent to all members of A.A.A.S. and in most libraries.

Science Books and Films. Reviews of books, films and filmstrips in all the sciences and education. Published by A.A.A.S. and found in many libraries.

Scientific American. Long articles written for the intelligent layman.

Science Times. Special section every Tuesday in the New York Times.

The Science Teacher. Journal of the National Science Teachers' Association. Articles on teaching science, book and media reviews for content sources.

The American Biology Teacher. Journal of the National Association of Biology Teachers. Articles on teaching biology and on biology-related issues. Book reviews and media reviews of content sources.

Social Education. Journal of the National Council for the Social Studies. Articles on teaching social studies and social science topics. Book and media reviews of content sources.

School Science and Mathematics. Journal of School Science and Mathematics Ass'n Frequently has excellent articles on teaching science and technology-related social issues.

Hastings Center Report. Published by the Hastings Center Institute for Society, Ethics and the Life Sciences. 360 Broadway, Hastings-on-Hudson, New York 10706. Analytical articles, brief items and articles based on case studies. Sent to members of the Center.

*Science 84. Published by the American Association for the Advancement of Science. Previous years were called Science 80, 81, etc. Excellent articles written for the layperson; high school students should be able to to read it easily.

Note: If bibliography is too long - this portion could be eliminated.

CONTENT SOURCES.

Abernathy, Virginia, Ed. Frontiers in Medical Ethics; Applications in a Medical Setting. Cambridge, MA: Ballinger Publishing Co., a Subsidiary of Harper and Row, 1980.

A collection of papers given at a symposium at Vanderbilt University School of Medicine in 1979. Published with underlying assumption that individuals in the lay community have significant rights and responsibilities in the area of medical decision-making. Includes some case studies. Notes at end of each paper. Index.

*Annas, George J. The Rights of Hospital Patients. New York, N.Y.: Avon Books, 1975. American Civil Liberties Union Handbook on hospital patients' rights.

Gives history of patient rights movement, forms of hospital organization and procedures, a discussion of confidentiality and privacy regarding medical records. Special chapters on women and children. Glossary of medical terms. Index.

*Augenstein, Leroy. Come, Let Us Play God. New York, N.Y.: Harper and Row, Publishers. 1969.

Clear discussion of issues--abortion, organ transplants, population

* Indicates high school level source.

control, mind control through drugs and surgery, and the basic question of who should make decisions in all these issues. Cases and questions; alterations in the stories and more questions. An excellent student sourcebook.

Bandman, Elsie L., R.N. and Bertram Bandman, eds. Bioethics and Human Rights. Boston, MA; Little, Brown & Co., 1978.

This is a "reader for health professionals." General introduction to the concept of rights and types of rights. Some rights discussed are the right to life and the boundaries of life, the rights of children and parents in biomedical situations, rights of aging persons, mentally ill and prisoners. References after each article. Index.

Beauchamp, Tom L. and James F. Childress. Principles of Biomedical Ethics. New York, N.Y.: Oxford University Press, 1979.

Intended audience is health-care professionals, philosophers, theologians and others concerned with applied ethics, but is written in non-technical terms.

Describes relevant ethical principles such as autonomy, non-malfeasence, beneficence and justice. Good chapter on patient-professional relationship and case studies which could be adapted for high school classes. Codes of ethics, bibliography, index.

Beauchamp, Tom L. and Le Roy Walters. Contemporary Issues in Bioethics, 2nd. ed. Belmont, CA: Wadsworth Publishing Company, 1982.

Each chapter contains a selection of readings. First chapters present theoretical concepts including health and disease and the patient-professional relationship. The general topics of Life and Death, Experimentation on human subjects, Biomedical and Behavior control technology and Human reproduction technology comprise the remainder of the book. Good teacher source.

*Bender, David L. and Richard C. Hagen, eds. Death and Dying: Opposing Viewpoints. St. Paul, MN: Greenhaven Press, 1980.

Part of "Opposing Viewpoints series. Contains short articles on the meaning of death in various religions, the question of when death occurs and various reactions to death, including the death of pets. Discussion Activities, Index and Bibliography.

*Bender, David L. Problems of Death. 2nd. ed. St. Paul, MN: Greenhaven Press, 1981.

Part of "Opposing Viewpoints series. Articles written from various viewpoints on Euthanasia, Abortion, Suicide and Funeral costs and practices. Is superior to the first edition. List of organizations to consult, discussion activities, case study on fetal experimentation.

*Bender, David L. and Bruno Leone. Science and Religion: Opposing Viewpoints. St. Paul, MN: Greenhaven Press, 1982.

Includes selections of short articles on various sides of the iddues of scientific knowledge versus religious belief, the origins of the universe and of life, and the role of religion in influencing science in the area of genetic manipulation and extra-uterine fertilization. Bibliography of periodicals, Index and activities for students.

Birenbaum, Arnold, Md. Health Care and Society. Montclair, N.J.: Allanheld Osmun, 1981. Part of Land Mark Studies.

Provides a sociology of health and illness in our society, discussion of patient-professional relationship and inter-relations on health-care teams. Indended audience is students and professionals in health sciences and medical sociology. A good teacher source on these topics for modern problems and sociology courses.

*Bohle, Bruce, ed. Human Life: Controversies and Concerns. New York, N.Y.: The H.W. Wilson Company, 1979.

Articles from newsmagazines and professional nursing and other journals on topics of bioethical dilemmas in genera, abortion, artificial insemination and in vitro fertilization, death and dying, ethical use of scarce medical resources. Bibliography.

Brody, Howard. Ethical Decisions in Medicine. Boston, MA.: Little, Brown and Company, 1976.

Procedures for problem-solving in ethical dilemmas and case-studies. This book is meant for health-care professionals, but cases can be adapted for use in high school classes.

*Carney, Thomas P. Instant Evolution: We'd Better Get Good at it. Notre Dame, IN.: Notre Dame Press, 1980.

Opening and closing vignettes reminiscent of Brave New World which could be good introductions to the issue of our increasing power over life, death and genetics. Good source of facts on genetics, written in clear prose. Author's ideas and views presented and identified clearly.

*Cooke, Robert. Improving on Nature: The Brave New World of Genetic Engineering. New York, N.Y.: Quadrangle/New York Times Book Company, 1977.

Quite clear and well-written explanation of research into the genetics of plants and animals both to improve them for human use and to discover how our own genes work to affect behavior and cause various disorders. Chapters on the dangers of and ethical questions involved in recombinant DNA and genetic manipulation research and technology.

*Dowling, Harry F. Medicines for Man. New York, N.Y.: Alfred A. Knopt, 1970.

A history of the development, regulation and use of prescription drugs. In covering issues of regulation of drug experimentation and sale by both government and the AMA, it illustrates the role of government and private industry in the health care field.

*Crick, Francis. Life Itself: Its Origin and Nature. New York, N.Y.: Simon and Schuster, 1981.

Clear, accurate descriptions of basic astronomy and biochemistry. Speculation on life being sent here from another planet gives one a chance to read a scientist's discussion of how to evaluate a scientific theory. Crick is one of the discoverers of the structure of DNA.

*Ehrenreich, Barbara and John. The American Health Empire: Power Profits and Politics. New York, N.Y.: Random House Vintage Books, 1971.
A report form the Health Policy Advisory Center growing out of an analysis of New York City's health care delivery system by the Institute for Policy Studies. Gives history of health care in the U.S., insurance systems and community action on health care.

*Ellison, David L. The Bio-Medical Fix: Human Dimensions of Bio-medical Technologies. Westport, CT: Greenwood Press, 1978.
Provides a clear discussion of the unintended consequences of technology and the lag between introduction of technology and social and political institutions to deal with the technology and its effects. Examples of past and possible future technological issues such as thalidomide, computer diagnosis, genetic engineering and artificial organs. Bibliography, Index.

Englehardt, H. Tristram and Daniel Callahan, eds. Science, Ethics and Medicine. Hastings-on-Hudson, N.Y.: Hastings Center, 1976. V.1 of Foundations of Ethics and their Relationship to Science.
Articles on ethics in science and technology. Of particular use are articles on value judgments of health and well-being by medical practitioners, and on moral decision-making. Notes after each article. Index.

Englehardt, H. Tristram and Daniel Callahan, eds. Knowledge, Value and Belief. Hastings-on-Hudson, N.Y.: Hastings Center, 1977. v. II of Foundations of Ethics and their Relationship to Science.
Articles by philosophers of science on the human side of medical care and ethics in medical practice. Informative article on interdisciplinary Approach (science plus ethics) to social problems. Notes after each article. Index.

*Greenberg, Selig. The Troubled Calling: Crisis in the Medical Establishment. New York, N.Y.: The Macmillan Company, 1965.
Background on the history of medicine in the U.S.A.;includes chapter on Group practice and the changing responsibilities of health care professionals.

Fletcher, Joseph. The Ethics of Genetic Control: Ending Reproductive Roulette. Garden City, N.Y.: Anchor Press/Doubleday, 1974.
Analyzes advances in techniques which alter or remove genes which cause srious defects within the framework of "situation ethics." This view is that any act or policy is the wisest as measured by the human or well-being that is contributes to the health, survival, growth, joy and/or self-realization of the people in the situation.

Flatcher, Joseph. Humanhood: Essays in Biomedical Ethics. Buffalo, N.Y.: Prometheus Books, 1979.
Presents the main features of rule and situation ethics. Analyzes various issues in biomedical technology, basically from the situation ethics viewpoint. See above.

Francke, Linda Bird. The Ambivalence of Abortion. New York; Random House, 1978.
Presents Ms. Francke's own experience with abortion and a history of abortion in the U.S.A. Contains interviews with women, men, teenagers and parents of teenagers who were involved in decisions to have abortions. Gives insight into the psychological effects of abortion on all concerned.

Franklin, Jon and Alan Doelp. Not Quite A Miracle. Brain Surgeons and their Patients on the Frontier of Medicine. Garden City, N.Y.: Doubleday and Company, Inc., 1983.

Gripping stories of several cases requiring brain or neurological surgery. Insights into the patients, the surgeons and the process of becoming a neurosurgeon. Might be frightening for some adolescents; others would find inspiration toward medical careers.

*Goodfield, June. An Imagined World. New York: Penguin Books, 1981/82.

Follows a woman scientist through several years of her work and gives valuable insight into the real process of scientific investigation and discovery.

*Goodfield, June. Playing God: Genetic Engineering and the Manipulation of Life. New York, N.Y.: Random House, 1977.

Clear, well-written story of the beginnings of recombinant DNA research and the efforts to control it. Excellent chapters on roles of science and society and vice-versa and on the unintended social effects of biotechnology. Appendices: NIH Guidelines for doing Recombinant DNA research, and the guidelines for it developed by the city of Cambridge, MA.

*Gornick, Vivian. Women in Science. New York, N.Y.: Simon and Schuster, 1983.

Sketches of women's careers in science, including women of various ages and backgrounds. Their life histories reflect both the changes and lack of change in the situation of women in science

*Harron, Frank, John Burnside, Md. and Tom Beauchamp. Health and Human Values. A Guide for Making Your Own Decisions. New Haven, CT; Yale University Press, 1982.

Chapters on making moral decisions using various types of ethical reasoning and the value and rights of human life. Specific topics are then discussed, inviting the reader to think about and write his/her reactions to them. Index. A Leader's Manual, A Digest of Law and Policy Development and A-V Resources in Biomedical Ethical Issues are part of this series, which is meant for the general public.

Hilton, Bruce, Daniel Callahan, Maureen Harris, Peter Condliffe, and Burton Berkely, eds. Ethical Issues in Human Genetics. New York, N.Y.: Plenum Press, 1973.

Proceedings of a symposium on Genetic Counseling and the Use of Genetic Knowledge in 1971.

Huxley Aldous. Brave New World and Brave New World Revisited. Harper and Row, Harper Colophon Books, 19 .

The famous story read by generations of college students is really about totalitarianism, but can be used to start discissions of in vitro gestation. Especially useful when read along with Huxley's own discussion in Revisited.

Jaco, E. Gartley, ed. Patients, Physicians and Illness. New York: The Free Press, 1958,1972, 2nd. ed., 1982.

Articles and research reports on various sociological factors affecting health, the role of the patient, community health and the health care system in the U.S. A. Notes as footnotes in each article. Index.

Kieffer, George H. Bioethics: A Textbook of Issues. Reading, MA; Addison-Wesley, 1979.

Introduction to ethics and ethical decision-making. Includes the issues of reproduction technology, Euthanasia, behavior control, population control and food production. Emphasis on our responsibility to future generations in relation to our treatment and use of nature. College-level reading.

*Klemm, W.R. Science, The Brain and Our Future. New York, N.Y.: Pegasus Books division of The Bobbs-Merrill Company, Inc, Publishers, 1972. A Biological Sciences Curriculum Study Book.

High school text on the workings of the brain and the central nervous system. Last chapter discusses the ethical issues involved in manipulating the brain with drugs and surgery and genetic techniques. Bibliography of articles 1960-70.

*Kubler-Ross, Elisabeth. On Death and Dying. New York, N.Y.: The Macmillan Publishing Company, Inc., 1969.

Excellent analysis of our cultural and individual responses to death. Cases and discussion about personal reactions to onw's own impending death and that of a family member. The first of Ms. Kubler-Ross' books, any of are excellent. Bibliography.

*Langone, John. Human Engineering: Marvel or Menace? Boston, MA: Little, Brown and Company, 1978.

Discusses our knowledge of how and when life originated and gives an account of early and recent experiments which yielded this knowledge. Moves on to the new methods of human reproduction, psychosurgery and other forms of mind manipulation. Provocative concluding chapter in which Skinner's Beyond Freedom and Dignity is discussed. Index. No notes or bibliography.

*Langone, John. Thorny Issues: How Ethics and Morality Affect the Way We Live. Boston, MA: Little, Brown and Company, 1981.

Gives a history of ethics and discussion of medical ethics regarding the dying patient, truth-telling by medical personnel, use of scarce medical treatments, human experimentation and lawful killing (war and capital punishment), nuclear energy and waste, and human rights. Index. Notes at end of book.

Levine, Carol and Robert M. Veatch. Cases in Bioethics from the Hastings Center Report. Hastings-on-Hudson, N.Y.: The Hastings Center, 1982.

Articles written for the intelligent adult layperson. Suitable for good senior high school readers. Covers several issues of public policy such as parental consent for treatment of children, teen-age sex behavior, and allocation of scarce medical resources, as well as death and dying and the patient-physician relationship.

Lindsay Jeanne W. Teens Parenting. Buena Park, CA.: Morning Glory Press, 1981.

Gives good advice on being a teen-age parent. It stresses too little how difficult it is. Authors hope the book will discourage teenagers from becoming parents, but their emphasis is on how possible, rather than how nearly impossible it is to be an effective parent, let alone a good teenage parent.

*Lowrance, William W. Of Acceptable Risk: Science and the Determination of Safety. Los Altos, CA.: William Kaufman, Inc., 1976.

Presents ways to measure risk from products and substances, judging their safety and making them safer to use.

Mappes, Thomas A. and Jane S. Zambaty. Social Ethics: Morality and Social Policy. 2nd. ed. New York, N.Y.: McGraw Hill Book Company, 1982.

Selections representing several viewpoints on each of the topics covered (the usual biomedical issues, with capital punishment and racial and gender discrimination included). Meant to be teachable—articles are as jargon-free as possible--at college level.

Mappes, Thomas A. and Jane S. Zambaty. Biomedical Ethics. New York, N.Y.: McGraw Hill Book Company, 1981.

Text for health care students and professionals. Excellent chapters on various systems of ethical reasoning . Chapters on the biomedical topics (which include allocation of scarce resources, preventative health care and recombinant DNA and the freedom of scientific inquiry) contain articles from various viewpoints. Excellent teacher sourcebook.

*Mason, William and Norton L. Marshall. The Human Side of Biology. New York; N.Y.: Harper and Row, 1983.

A good high school biology text which contains references to biotechnological issues.

McCormick, Richard A. How Brave a New World? Garden City, N.Y.: Doubleday and Company, Inc., 1981.

Mc Cormick is a leading Roman Catholic scholar and ethicist, but this book includes other viewpoints besides the Catholic. Good chapter on the concept of health and the effects of modern life on our ethics. Footnotes and Index.

Norman, Colin. The God That Limps: Science and Technology in the Eighties. New York, N.Y.: W.W. Norton and Company, 1981.

Hephaestus, the Greek god of fire and metal working is portrayed as walking with a limp. Norman's title refers to the handicap technology is revealing at present as our problems can no longer be solved with technology as much as with social and political measures. Excellent discussion of the double-edged nature of technology and how we can deal more effectively with its less desirable side-effects.

*Overmire, Thomas G. Ionizing Radiation and Life. Chicago, IL: Rand McNally and Company, 1970. Prepared under the aegis of the Biological Sciences Curriculum Study.

Introduction to the biological effects of radiation. Bibliography. Index.

*Panati, Charles. Breakthroughs: Astonishing Advances in Your Lifetime in Medicine, Science and Technology. Boston, MA: Houghton Mifflin Company, 1980.

Describes recent and poteitial advances in holistic (treating mind and body) medicine, nutrition, medical care adn treatments, communications technology, space travel and colonization, biorhythms, energy sources and transportation technology. Notes at end of book.

*Perlman, D. Antibiotics. Chicago, IL: Rand McNally, 1970. Prepared under the aegis of the Biological Sciences Curriculum Study.

Describes the production and medicinal and agricultural uses of antibiotics. Bibliography. Index.

Potter, VanRenselaer. Bioethics: Bridge to the Future. Englewood Cliffs, N.J.: Prentice Hall, Inc., 1971

One of the early books on bio-technology and its repercussions. A call for an informed scientific and lay community working to use knowledge for the social good. Excellent teacher source for rationale for teaching about technology-related social issues.

Restak, Richard. Premeditated Man: Bioethics and the Control of Future Human Life. New York, N.Y.: Penguin Books, 1977; oroginally by Viking Press, 1975.

Describes the social revolution which may be stimulated by the use of biomedical technologies. Good teacher source.

Rifkin, Jeremy. Algeny. New York, N.Y.: The Viking Press, 1983.

After he finishes his hatchet job on Darwin, Rifkin has some important things to say about the social effects of human control of their own genetics and that of other species as well. Good discussion of the human tendency to justify what their technology allows them to do by calling it "natural."

*Rifkin, Jeremy and Ted Howard. Who Should Play God? New York, N.Y.: Dell Publishing Company, 1977.

This is a history of the discovery of DNA and of the earlier Eugenics movement. Current and potential genetic technologies--probable and less probable--are discussed, and one chapter is devoted to the relationship between science and industry in the U.S. Dell publishes a teacher's guide with discussion questions and student activities to use with the book.

Rothman, Stanley and Charles Mosmann. Computers and Society. Chicago, IL: Science Research Associates, 1972.

An introductory text about computers which includes some provocative ideas and good discussion questions.

Sayers, Janet. Biological Politics:Feminist and Anti-feminist Perspectives. London: Tavistock Publications, 1982.

Discusses stereotypes of women and how they have affected the treatment of women by government and other institutions, including the medical professions. Draws heavily on psychologists in the discussion of women's development.

*Sayre, Anne. Rosalind Franklin and DNA. New York, N.Y.: W.W. Norton and Company, Inc., 1975.

Ms. Sayre, who knew Rosalind Franklin, tells the story, which Watson twosted and misrepresented in The Double Helix, of Miss Franklin's contribution--x-ray crystallography--to the discovery of the structure of DNA.

Shannon, Thomas, ed. Bioethics: Basic Writings on the Key Ethics Questions that Surround the Major Modern Biological Possibilities and Problems. Revised ed. Ramsey, N.J.: The Paulist Press, 1981. Orig., 1976.

Explains the Roman Catholic viewpoint on bioethical issues in general. Contains articles which discuss the usual biomedial issues, including the treatment of defective newborns and allocation of scarce medical resources from the Catholic and some other viewpoints. Good teacher source. Bibliography at end of each section, notes at end of each article.

*Shannon, Thomas and James J. DiGiacomo. An Introduction to Bioethics. Ramsey, N.J.: Paulist Press, 1979.

An excellent student text to introduce the field of bioethics and the effects of technology on society. The Roman Catholic viewpoint is clearly emphasized, but others are included as well. Good discussion questions at end of each chapter, reading lists.

Silver, Michael. Facing Issues of Life and Death. ST. Louis, MO: Milliken Publishing Company, 1976. Part of Contemporary Values series.

This book contains short introductory essays on the issues--death, abortion, behavior and mind control, cloning, fetal and genetic experimentation—and transparencies and duplicating masters for classroom use. The coverage is too brief and superficial to stand alone. As a supplement,

to other materials, some of the material in this book could be used.

*Taylor, Gordon Rattray. The Biological Timebomb. New York, N.Y.: New American Library--Signet Books, 1968.
One of the first of the genre. While some of the material is outdated, the majority is current--some of the things Taylor speculates about are now in use, such as embryo transplants. Can be an interesting study in the history of biotechnology.

Varga, Andrew C. The Main Issues in Bioethics. Ramsey, N.J.: Paulist Press, 1980.
Written for the intelligent layperson, this book gives a very brief introduction to types of ethical reasoning, followed by short chapters on most of the biomedical issues. Author's views are clearly stated. Appendices include the Declaration of Helsinki, Nuremberg Code and the AMA Ethical Guidelines for Clinical Investication. Index.

*Thomas, Lewis. The Youngest Science. Notes of a Medicine Watcher. New York, N.Y.: Bantam Books, 1984; Viking Press, 1983.
Thomas's personal odyssy as the son of a physician and as a practicing physician during the decades during which medicine changed from art to science.

Veatch, Robert M. A Theory of Medical Ethics. New York, N.Y.: Basic Books, Inc., Publishers, 1981.
Good source of a clear descriptions of principles and bases of medical ethics. Chapter Two relates cases and principles of ethics. Teachers can adapt the cases and discussion for classroom use. Bibliography. Index. Excellent teacher source.

Visscher, Maurice B., Ed. Humanistic Perspectives in Medical Ethics. Buffalo, N.Y.: Prometheus Books, 1972.
Articles on a variety of topics—sanctity of life, right to die, medicine and the military, human experimentation, birth defects. Teacher source for information on these topics.

Volpe, E. Peter. Biology and Human Concerns. Dubuque, IA: William C. Brown Company, 1983.
College-level biology text with references to the social issues raised by biotechnology.

*Wade, Nicholas. The Ultimate Experiment: Man-Made Evolution. New York, N.Y.: Walker and Company, 1977.
Wade, who writes for Science, describes the discovery and workings of DNA and of recombinant DNA techniques, and gives a history of the controversies over control of the latter. Notes at ends of chapters, Index.

*Warshofsky, Fred. The 21st Century. The Control of Life. New York, N.Y.: The Viking Press, 1969.
Facts about then-current biomedical technology. Hints at social questions, but does not ask them directly. Based on a T.V. series, 21st. Century" Index.